

https://dspace.org/

Achieving and maintaining inventory accuracy in a South African Mrp-ii environment

De Freitas, Paulo Jose Felix

2015-03-04
http://hdl.handle.net/10539/17090

Downloaded from a DSpace repository. https://dspace.org/

ACHIEVING AND MAINTAINING INVENTORY ACCURACY IN A SOUTH AFRICAN MRP-II ENVIRONMENT

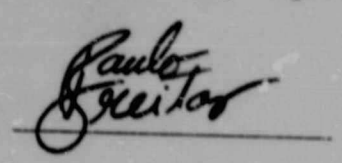
Paulo Jose Felix de Freitas

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

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

In memory of my father

Jose Jorge de Freitas

whose outstanding guidance I try to follow.

1930-1983

ACKNOWLEDGEMENTS

A very special thanks to Maria Antonieta for all her assistance, advice and encouragement given to me in the preparation of this report.

and

to Sulzer Brothers Management for their financial assistance throughout my MSc studies, for all the training they have exposed me to and for all the trust they have put in me.

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 MANAGEMENT 18

5.0 SLALOM IMPLEMENTATION - THE PROJECT MANAGEMENT APPROACH 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

8.0 INTRODUCTION TO THE MATERIALS HANDLING DEPARTMENT 50
8.1 Materials Handling Projects 51

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.

---------//---------

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):

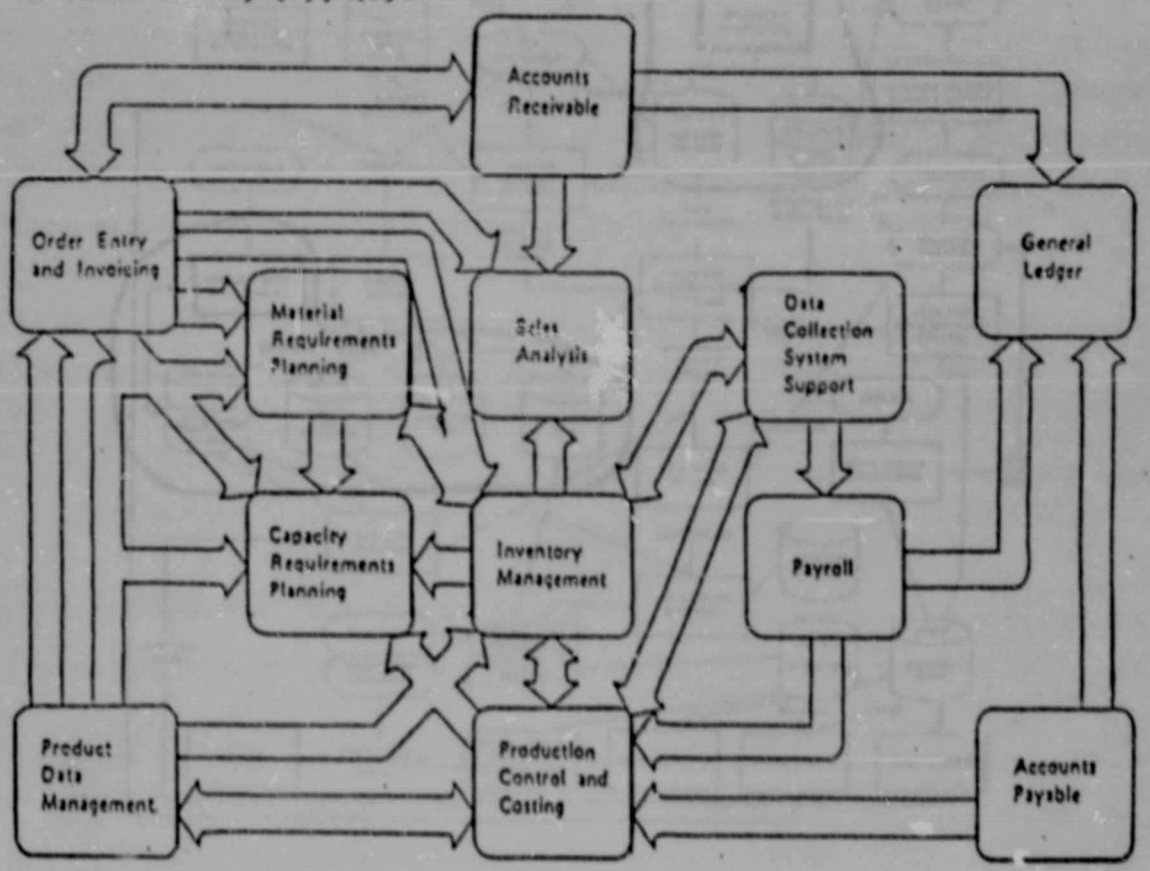


FIGURE 2.1: MRP-II's Communication Network Between Individual Modules, (8).

Computer based manufacturing systems, such as MRP-II, are very complex systems as can be appreciated from figure 2.2. This figure presents an overview of the systems in use at Sulzer, called Manufacturing Accounting and Production Information Control System (MAPICS). MAPICS is IBM's tradename for their MRP-II equivalent system. The two modules enclosed in a balloon, Product Data Management (PDM) and Inventory Management (IM), are the first modules which must be installed, because they serve as pillars to the remainder of the applications.

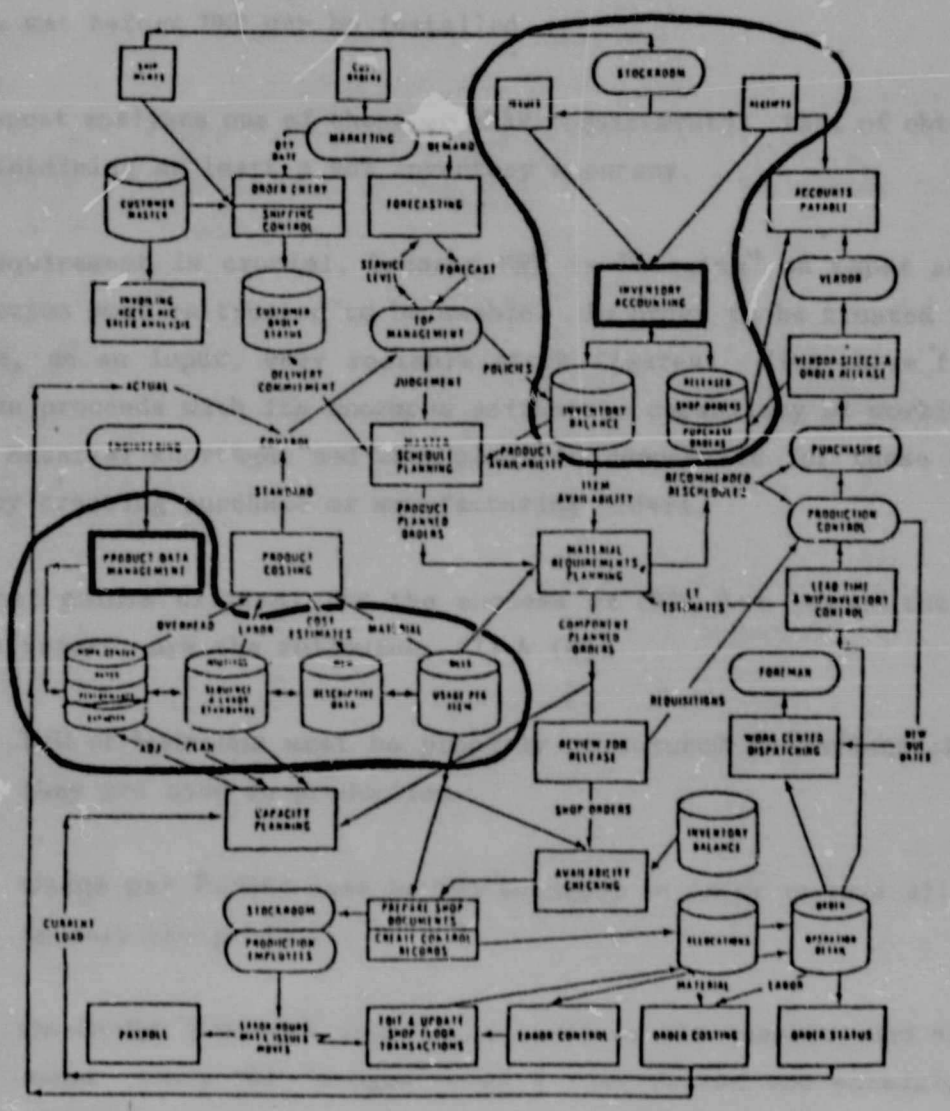


FIGURE 2.2: Overview of the MAPICS Computer Based Manufacturing System, (7).

MRP-II is most successful when tacked 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).

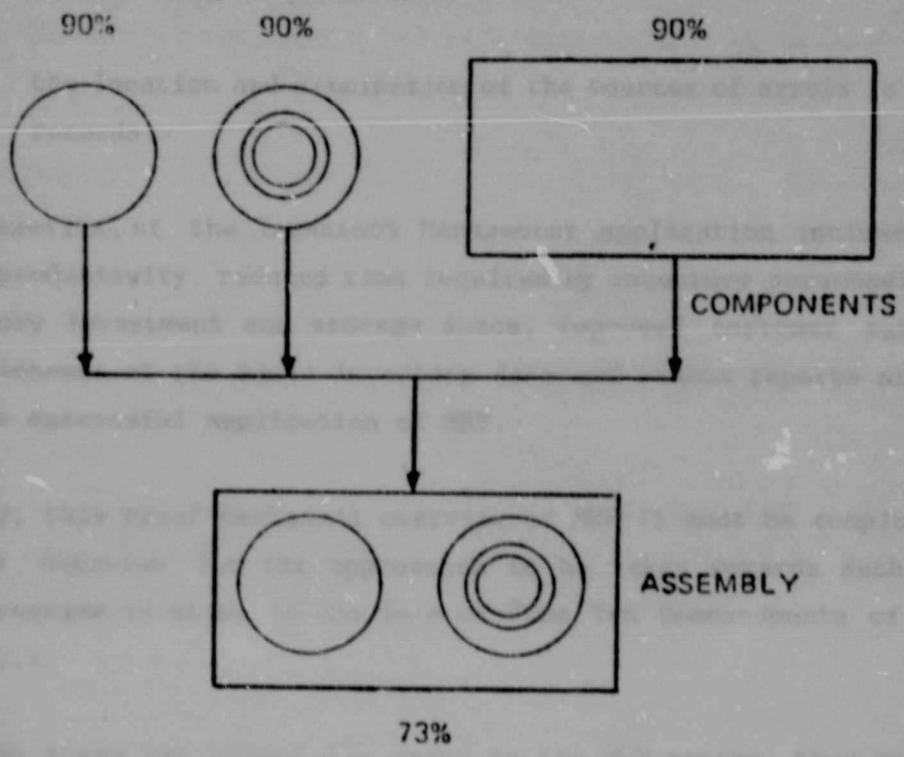


FIGURE 2.3: Effect of Accuracy Levels on the Final Assembly,(7).

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:

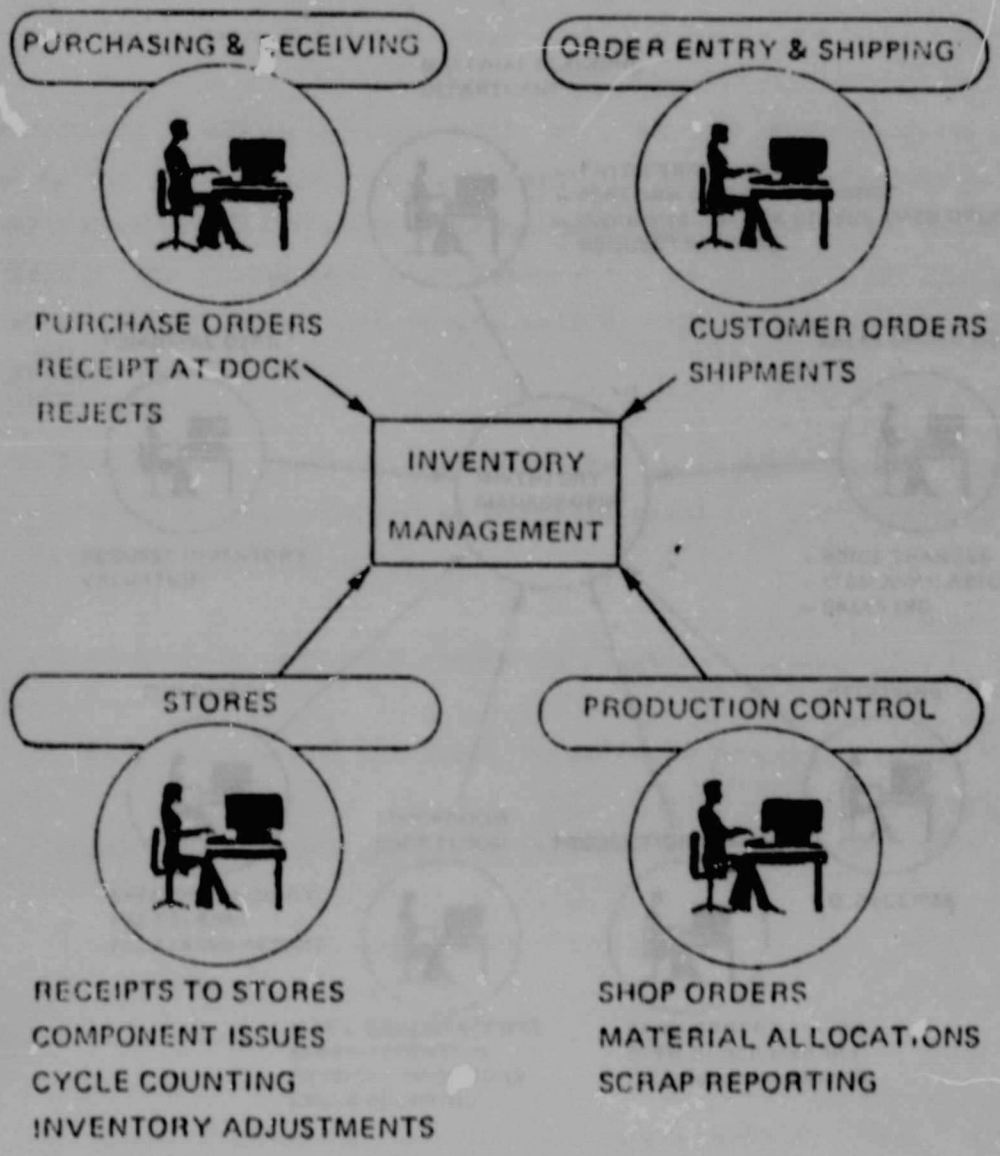


FIGURE 3.1: On-Line Processing of Inventory Transactions,(8).

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.

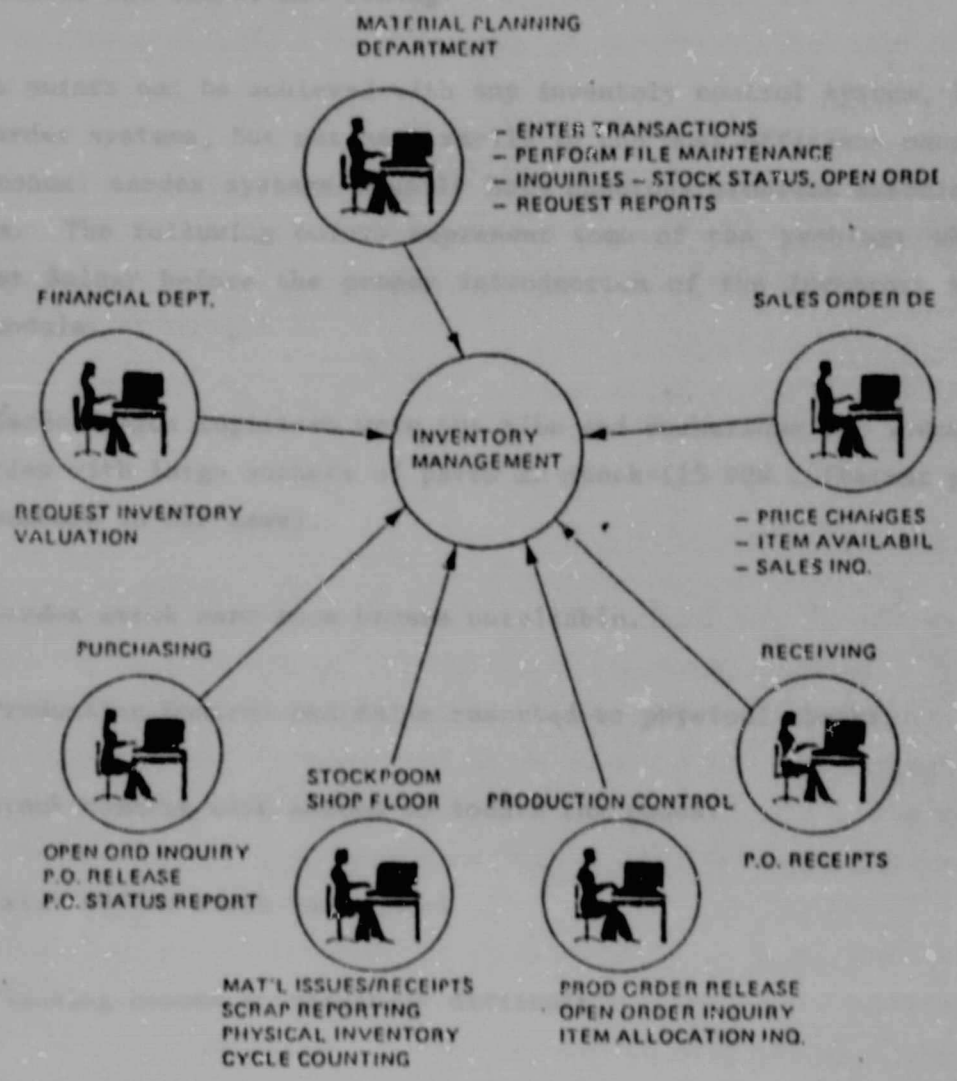


FIGURE 3.2: Inventory Management's Relationship to Functional Departments,(8).

Author De Freitas P J F
Name of thesis Achieving and maintaining inventory accuracy in South African MRP-11 environment 1986

PUBLISHER:
University of the Witwatersrand, Johannesburg
©2013

LEGAL NOTICES:

Copyright Notice: All materials on the University of the Witwatersrand, Johannesburg Library website are protected by South African copyright law and may not be distributed, transmitted, displayed, or otherwise published in any format, without the prior written permission of the copyright owner.

Disclaimer and Terms of Use: Provided that you maintain all copyright and other notices contained therein, you may download material (one machine readable copy and one print copy per page) for your personal and/or educational non-commercial use only.

The University of the Witwatersrand, Johannesburg, is not responsible for any errors or omissions and excludes any and all liability for any errors in or omissions from the information on the Library website.