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

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Management module, twice a day, which in turn transfers this data to a printout once a month. Therefore a monthly report is available with all the historical transactions which took place in the past month, for each particular article number (see figure 12.1).

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| TY | ITEM NUMBER | SH | QUANTITY | ORDER | LOC | DATE | UM | GC | CP | NEW LOC | USER ID | REFERENCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ST | 1046075634G1 | 1 | 1 | | CGSIN | 860704 | EA | 2 | | CE29 | | |
| IP | 1046075672G0 | 1 | 1 | MB15140 | 4A03C | 860708 | EA | 2 | | | P#14 | |
| IP | 1046075672G0 | 1 | 1 | MB15200 | 4A03C | 860708 | EA | 2 | | | P#14 | |
| ST | 1046075684G1 | 1 | 1 | P045966 | CE36D | 860704 | EA | 2 | | CE27 | | |
| RP | 1046075684G1 | 1 | 3 | P013797 | EN37J | 860715 | EA | 3 | | | | M103060 |
| RM | 1046075684G1 | 1 | 1 | P013799 | EN38A | 860725 | EA | 4 | | | | M103060 |
| IP | 1046075702G0 | 1 | 2 | MB14980 | A032C | 860718 | EA | 2 | | | JS14 | |
| ST | 1046075704G1 | 1 | 1 | | CE31C | 860704 | EA | 2 | | CE27 | | |
| RM | 1046075722G0 | 1 | 5 | M103990 | DL10 | 860714 | EA | 2 | P | | P#14 | |
| ST | 1046075722G0 | 1 | 5 | M103990 | DL10 | 860714 | EA | 2 | | A031B | | |
| IP | 1046075722G0 | 1 | 1 | MB15320 | A031B | 860716 | EA | 2 | | | JS14 | |
| SA | 1046075722G0 | 1 | 2 | C000230 | A031B | 860718 | EA | 2 | | | | 200452 |
| SA | 1046075722G0 | 1 | 2 | C000496 | A031B | 860718 | EA | 2 | | | | 200454 |
| IP | 1046075724G1 | 1 | 5 | M133040 | CE36A | 860703 | EA | 2 | | | P#14 | |
| ST | 1046075724G1 | 1 | 10 | P006407 | CE36A | 860704 | EA | 2 | | CF | | |
| IP | 1046075732G0 | 1 | 1 | MB15320 | A022F | 860716 | EA | 2 | | | JS14 | |
| ST | 1046075732G0 | 1 | 22 | MB32930 | A022F | 860723 | EA | 2 | | A007D | | |
| IP | 1046075732G0 | 1 | 1 | MB15520 | A007D | 860724 | EA | 2 | | | JS14 | |
| SA | 1046075732G0 | 1 | 1 | C000778 | A022F | 860718 | EA | 2 | | | | 200470 |
| SA | 1046075732G0 | 1 | 4 | C001014 | A007D | 860723 | EA | 2 | | | | 200691 |
| ST | 1046075734G1 | 1 | 2 | P043305 | CE35D | 860704 | EA | 2 | | CE27 | | |
| RM | 1046075760G2 | 1 | 12 | M104330 | DL07 | 860715 | EA | 2 | P | | P#14 | |
| ST | 1046075760G2 | 1 | 12 | M104330 | DL07 | 860715 | EA | 2 | | BN67E | | |

**FIGURE 12.1: Transaction History Report**

If for example, a cycle count programme covers a certain area three times per year, then it means that errors encountered on the last count will be at most four months old. The only reliable source of information on what happened to an item in error, four months ago, is the Transaction History Report.

This report is similar to the common monthly Bank Account Statements with its debits, credits and balances. In the same way, one can tally all past

deposits and withdrawals up to the present amount carried forward, the Transaction History Report allows the reconciler to work through the audit trail up to the present balance on hand.

## 12.4 CONTROL BOOKS

Sequence Number Control Books were implemented, as mentioned in section 11.4.2, in order to lock the paperflow and goods into step. The reconciler may wish to probe these control points for gaps in the sequence of incoming work. These gaps can lead to the cause for the stock error, specially in those books which control the movements of unplanned transactions.

## 12.5 OTHER DEPARTMENTS

This sub-system called "Other Departments", is just a general name for the many "trails" which lead to those departments which feed to, or from Stores. Departments like Quality Control, Assembly, Workshop, Creditors, Costing, Planning, Industrial Engineering, Reconditioning and Design Office, all have some physical connection with the Materials Handling department.

It is known that many opportunities for error exist in each of the above-mentioned departments and some of these errors do filter through to stock. When it is suspected that a department outside Materials Handling is responsible for the error, then the reconciler must, if possible, go to that department and continue to investigate the cause of error.

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The best stock reconcilers must therefore have a good knowledge of the other manufacturing departments and of their corresponding computer systems.

Finally when the search is over, there may still be those unsolved errors which must nevertheless be adjusted to reflect the actual balance-on-hand. These should constitute a small percentage of the total number of errors, otherwise many causes of errors will not be discovered and the inventory accuracy level is unlikely to improve.

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## 13.0 TRAINING AND EDUCATION

To achieve the required MRP inventory accuracy level of 98%, a complete training programme must be developed and implemented. MRP education was given to all personnel, but to different training degrees depending on position. This educational aspect is vital for MRP's success, and is considered to be one of the highest priority tasks in achieving high inventory accuracy (4),(7) & (8). The author has also observed that jumps in percentage accuracy, resulted after intensive training sessions were given to people involved in Materials Handling.

## 13.1 THE EDUCATIONAL PROGRAMME

The successful educational programme adopted by Sulzer involved the following:

1. Education to all top and middle managers involved in production, was given on the subject of MRP-II, including portions on Inventory Management. This training programme was given by outside consultants, before SLALOM and the Cycle Counting Programme were implemented.

2. Educational courses on SLALOM, Inventory Accuracy, and Cycle Counting were given to all the managers associated with the Materials Handling department. This series of lectures took place just before the implementation of SLALOM, with the purpose of informing managers about the upcoming changes that would be taking place in their departments and how these changes would affect their subordinates' jobs.

3. In-house education, mainly on SLALOM, was given to the Materials Handling personnel, by the Project Team responsible for SLALOM's im-

plementation. All members of the Project Team were present at the two previous educational phases.

4. With SLALOM's terminology and requirements understood by everyone in the department, the next step was to set up an extensive training programme.

## 13.2 THE TRAINING PROGRAMME

Part of the struggle for the elimination of inventory errors, was won by means of a series of critical analyses of the original working procedures. This involved the restructuring of all the procedures in order to make them more efficient and error-proof, and also to integrate the newly implemented computer system requirements into the procedures. This major exercise was done in the following way:

1. Identify the procedures which are known to cause the most harm to the inventory accuracy and call for a work session with the respective personnel.

2. Use one or more work sessions to improve and update these procedures, taking into consideration any changes that might affect other departments.

3. Repeat the above steps until all the sections of the Materials Handling department are covered.

4. After establishing that all the modified procedures are practical and have a marked effect on the accuracy levels, announce them as the official guidelines to be followed by all personnel.

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5. Use the new procedures for training and later for the assessment of the subordinates' knowledge of their working methods.

## 13.3 THE "X-Y CHARTS" METHOD FOR THE DEVELOPMENT OF PROCEDURES

Working procedures for a department may be put together in the form of a manual or flow diagrams. These are then used for training or referencing purposes. In Sulzer's case, all the new procedures were done in the form of "X-Y Charts". This is a technique with many advantages over the traditional "work manual" format. The method of X-Y charting is very simple and is described as follows (13):

1. Divide a table into Events, Activity and Departments or people involved (see figure 13.1).

2. Decide on an event, like, "Goods to stores; Purchase Orders".

3. For each simple action or activity which forms part of the event, establish:

   - Which department performs the action and write "X" under the department's column.

   - Which department, if any, obtains the results of the previous department's actions and write a "Y" under this department's column.

For example, in figure 13.1, the first line says, "Pass goods and documents". This action is done by Goods Receiving(X) and is received by Stores(Y).

STORES

MODIFICATION LEVEL : H=001/L=000

| EVENT | ACTIVITY | G/R EC | ISSUE | COMPILE | QUIRE | PRINTS | SFIRE | RISK | ISSUE PAPER | SALE REST | DATA UTIL | CLAIM PTI RIC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | |
| GOODS TO STORES | PASS GOODS & DOCS. | X | Y | | | | | | | | | |
| PURCHASE ORDER | ENTER INFO INTO C/REC | | X | | | | | | | | | |
| | SEQUENCE CONTROL BOOK. | | | | | | | | | | | |
| | CHECK AND SIGN C/BOOK. | | X | | | | | | | | | |
| | STAMP "LOC INQ" H/COPY | | X | | | | | | | | | |
| | WITH "MULTI LOC STAMP". | | | | | | | | | | | |
| | PACK GOODS INTO BIN | | X | | | | | | | | | |
| | WRITE QTY&LOC INFO ON | | X | | | | | | | | | |
| | STAMP. | | | | | | | | | | | |
| | STAMP-LOC INQ HARD COPY | | X | | | | | | | | | |
| | WITH 'ST' STAMP. | | | | | | | | | | | |
| | DO 'ST' TRANSACTION. | | X | Y | | | | | | | | |
| | ENTER P/O NUMBER & QTY | | X | | | | | | | | | |
| | INTO P/O TRANS COMPLETE | | | | | | | | | | | |
| | CONTROL BOOK. | | | | | | | | | | | |
| | CHECK 'IN' LOC EMPTY. | | X | | | | | | | | | |
| | SIGN P/O TRANS COMPLETE | | X | | | | | | | | | |
| | CONTROL BOOK. | | | | | | | | | | | |
| | FILE P/O AND LOC INQ | | X | | | | | | | | | |
| | HARD COPIES. | | | | | | | | | | | |
| WORKS ORDER | PASS GOODS WITH S/PACK | | Y | | | | X | | | | | |
| RECEIPTS | TRAVELLER. | | | | | | | | | | | |
| | CHECK ARTICLE NUMBER & | | X | | | | | | | | | |
| | QUANTITY PHYSICALLY. | | | | | | | | | | | |

FIGURE 13.1: Example of Portion of a X-Y Chart for the Materials Handling Department

## 13.3.1 ADVANTAGES AND USES OF X-Y CHARTS

The author has identified the following advantages from the extensive creation and revision of X-Y charts in his department and others.

1. X-Y charts are simple, uncluttered with redundant information as found in some manuals, and easy to learn and develop.

2. When used for developing procedures, it presents all the activities in the form of instructing verbs, such as write, do, stamp, etc.,

thereby breaking down jobs into any number of work elements, depending on the amount of detail required.

3. Because of the way that events are broken down into activities, the X-Y chart shows redundancies in work methods and loopholes or loose ends in the flow of data or work. This results in a much more efficient and simplified working procedure.

4. Unlike manuals, presentation style is independent of the writer's style. This is beneficial when studying other department's X-Y charts.

5. The X-Y chart's greatest advantage is that when work procedures change, the modification and updating of the X-Y chart is done much faster than the updating of any of the other more traditional methods. Thus, with little effort, the working procedures will always remain valid training documents.

6. New employees get trained by following the flow of actions and paperwork through the X-Y charts, while existing personnel use them as references.

7. Another advantage is that a well developed X-Y chart may also be used as a job description. This is done by assigning a person to be responsible for one or more events, in the X-Y procedures.

## 13.4 EFFECTS OF EDUCATIONAL LEVELS ON OPERATIONS

As seen so far, a large amount of effort was put into, firstly, educating managers and workers about systems like MRP-II and SLALOM, secondly, into the restructuring of work procedures by means of X-Y charts and thirdly, the training of all personnel on the most recent set of valid procedures.

Great improvements were made to the overall stock accuracy as a result of these steps, but one factor acted in a way that slowed down the otherwise quick attainment of high accuracy levels. This factor, was the low educational levels of most of the non-managerial workforce.

The fact that many workers had a sub-standard education first became apparent, when the author developed a test as part of one of his training sessions. This test consisted of very basic Materials Handling questions and was intended to assess the workers' knowledge of their work procedures. Instead, it surprisingly identified shortages in other skills, such as Numeracy and Literacy.

Not having sufficient evidence to prove that most workers, specially in the Black group, did not have the educational standards required by their job descriptions, the author requested the help of external consultants.

These consultants being experts in the fields of Numeracy and Literacy testing, were requested to supply a test covering these fields up to a standard five level.

Management decided that this test would have to be applied to all non-managerial Black and White workers in all manufacturing departments. The objective was to determine where the shortage of skills were, and which people had potential supervisory capacities.

The results of the test are shown in figure 13.2. This figure is analysed by relating the obtained results to the needs of the Materials Handling department as well as by relating the low educational situation found, to that in South Africa.

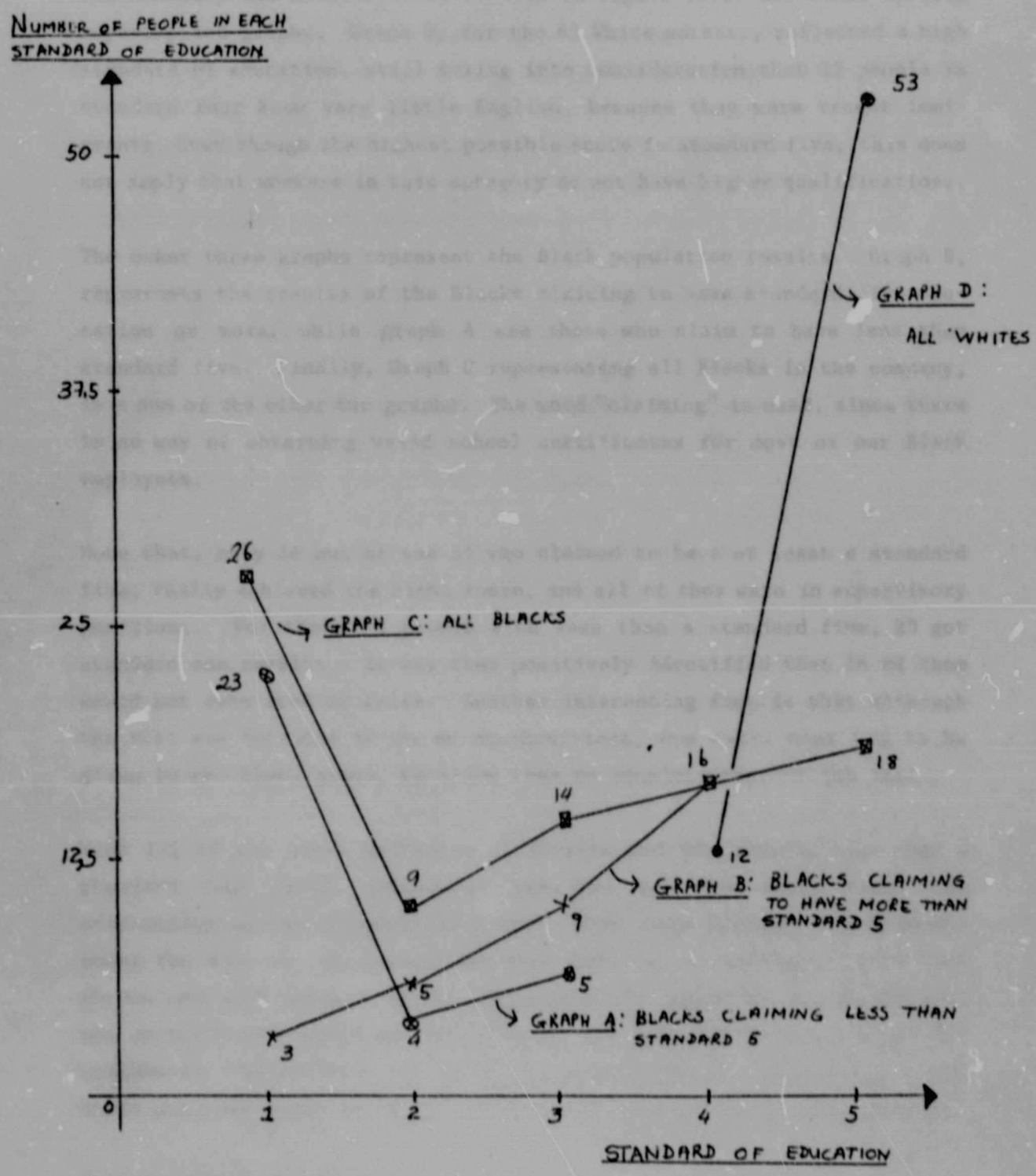



**FIGURE 13.2: Results of the Literacy and Numeracy Tests done on all Non-Managerial Personnel (83 Blacks and 65 Whites).**

The Numeracy and Literacy test results in figure 13.2, are shown by four superimposed graphs. Graph D, for the 65 White workers, reflected a high standard of education, still taking into consideration that 12 people in standard four knew very little English, because they were recent immigrants. Even though the highest possible score is standard five, this does not imply that workers in this category do not have higher qualifications.

The other three graphs represent the Black population results. Graph B, represents the results of the Blacks claiming to have standard five education or more, while graph A are those who claim to have less than standard five. Finally, Graph C representing all Blacks in the company, is a sum of the other two graphs. The word "claiming" is used, since there is no way of obtaining valid school certificates for most of our Black employees.

Note that, only 18 out of the 51 who claimed to have at least a standard five, really achieved the right score, and all of them were in supervisory positions. For those 32 people with less than a standard five, 23 got standard one results. It was then positively identified that 16 of them could not even read or write. Another interesting fact is that although the test was intended to be an one-hour-test, one extra hour had to be given to the Black group, to allow them to complete most of the test.

With 20% of the Black workforce illiterate and 60% getting less than a standard four level, management realised for the first time, the criticality of the shortage of basic skills like Literacy and Numeracy among the Blacks. To counteract this problem, a training centre was formed and each manager became responsible to identify the gap between the worker's test score and his present job description educational requirements. Thereafter, the worker is sent to the training centre a few hours per week until he is qualified enough to hold his present position.

The training of Black employees is a separate issue from traditional manpower development. Not that the Blacks are different to the Whites in South Africa, as people, but because in general, they do not have the

same exposure to Western technology, business and industry as the Whites do. Therefore, the Blacks do not have the same industrial and commercial sophistication of the Whites, simply through lack of experience.

Industrial trainers encounter problems when training Blacks that are not normally found when training Whites. According to Bernard Chalmers (11), the most commonly experienced problems are:

- Poor educational background and lack of exposure to Western technology, commerce and industry.
- Lack of ability to practicaliy apply theoretical knowledge.
- Lack of confidence and unwillingness to ask questions.
- Lack of enthusiasm on the part of managers for sending workers for training.

Although, the author is not able to compare the average educational level of a South African factory worker to the European or American levels, he expects it to be lower. This could mean that a South African manager has to work more than his American counterpart, at developing smarter systems and procedures in order to achieve a reasonable success in projects like MRP-II.

The end result of the project success may not necessarily be different, but the time taken to get to those desired goals, can definitely be affected, when 60% of the entire Black workforce has little or no education. Note that this 60% comprises of workers holding jobs such as forklift drivers, expeditors, clerks or material controllers, where one is expected to read, write and count.

Another obstacle to project success, is the difficulty in improving the motivation of South African Blacks, to attain tough goals such as a 98% inventory accuracy level for a large warehouse.

Presently, 40% of all errors in Sulzer's inventory, are known to originate from Black workers, mainly Pickers, Packers, and their direct supervisors. Many techniques were used to motivate them, but to this day none have had a marked effect on the improvement of their required work discipline.

This lack of concern for excellence and achievement was also noticed by Nasser (12) in his studies of the basic human motivation needs in South African businesses. The basic human needs are the need for affiliation (n-AFF), achievement (n-ACH) and power (n-POW).

Nasser (12) indicates that the most predominant need among Blacks is the need for Affiliation which is characterised by:

- Reluctance to function autonomously and to handle increased responsibility.

- Lack of assertiveness.

- Slowness in decision-making.

- Low propensity for risk taking.

- Lack of innovation and creativity.

- Lack of initiative in resolving obstacles in the pathway of achieving corporate goals.

Individuals with high n-ACH, have opposite behaviours to those with n-AFF, and there is a significant relationship between the number of high achievers in a nation and its economic growth.

Nasser(12), points out that "*the more economically prosperous nations have a 15% n-ACH, 85% n-AFF mix in their workforce. However, among the Black population of South Africa, there is a major bias toward n-AFF with*

*only a small incidence of n-ACH, whereas the limited evidence available indicates a 15% n-ACH, 85% n-AFF mix among the Whites".*

The clear implication of the facts presented in this section, is that employers need to raise the educational levels and the incidence of high n-ACH in the Black population, if South Africa is to have the managers, supervisors and entrepreneurs it needs for its future economic development.

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## 14.0 CONCLUSION: 8 STEPS TO ACHIEVE AND MAINTAIN HIGH INVENTORY ACCURACY

Since the time, two years ago, when stock accuracy levels were as low as 50%, many aspects of Materials Handling have changed. The author, in this concluding section, has formulated the eight main steps that have contributed significantly towards the changes that were critical to the continuous effort of attaining high inventory accuracies. After these steps, the author then presents the benefits enjoyed by the organisation as a result of the high inventory accuracies and finally, he compares these achievements to those obtained by other people in the relevant literature.

### Step 1 - Project team and the MRP-II Programme

1. Appoint Project team members and a leader reporting to the Divisional General Manager.

2. Care must be taken, when adopting a Project Management Approach together with Matrix Structures, that "conflict" does not cause unreasonable delays to the entire programme.

3. A complete MRP-II programme must be drawn, allowing for the uncertainty associated with the time needed to implement modules or activities situated on the critical path.

4. Computer-assisted operating systems, like SLALOM, must be thoroughly tested for their suitability to a particular business environment, before they are bought or installed. Otherwise, the project goals and budgets may not be achieved.

**Step 2 - Education**

1. Top management must be made aware of the concepts and requirements of MRP-II, in order to be able to support it throughout its implementation. This must include education on Inventory Management.

2. Managers in the Material's Handling department and other associated departments must be fully exposed to the topics of Inventory Accuracy and Cycle Counting.

3. New terminology and procedures must be understood by all workers in those departments responsible for inventory accuracy. This can be achieved by in-house lectures and practical sessions.

**Step 3 - Security**

1. Establish inventory security to control the inventory accuracy itself, by means of installing self-shutting lockable doors at all access points.

2. Put up "restricted area" signs and communicate the purpose of security to improve the inventory accuracy, to everyone.

3. Establish transaction security to improve on data capture accuracy.

4. Allocate transaction processing responsibility to one or two operators and place them in a central office, to where all documentation must be channelled, so that paperflow control can be improved.

## Step 4 - Cycle Counting

1. Develop a cycle counting programme to cover your inventory in such a way as to make the traditional annual stock take an obsolete exercise.

   One typical Cycle counting programme includes:

   - An Initial Phase: to identify and eliminate the causes of error.

   - An Intermediate Phase: to eliminate the need for the annual shutdown.

   - A Mature Phase: to maintain and control the required accuracy levels.

2. Select a person with a good product knowledge, to be responsible for the counting and publishing of results, preferably from a department other than the Materials Handling.

3. Select a technique for the continuous counting such as:

   - ABC classification

   - Geographical areas

   - Random selection

4. Establish ranges for error tolerances for each category of stock. For example, deviations of plus or minus 3% in all weigh-counted items are not considered as errors.

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