EVALUATION OF ENTERPRISE RESOURCE PLANNING IMPLEMENTATION SUCCESS: CASE STUDY IN ZIMBABWE

L Kambarami¹, S Mhlanga²*, T Chikowore³

¹,²,³Department of Industrial and Manufacturing Engineering
National University of Science and Technology, Bulawayo, Zimbabwe
chikoworet@gmail.com

²Faculty of Engineering and the Built Environment
University of Johannesburg, South Africa
smhlanga126@gmail.com

ABSTRACT

Enterprise Resource Planning (ERP) systems encompasses modules supporting functional areas such as planning, manufacturing, sales, marketing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, transportation and e-business. The architecture of the software facilitates transparent integration of modules, providing flow of information between all functions within the enterprise in a consistently visible manner. This paper is a case study to evaluate implementation at Case Study Company in Zimbabwe. An analysis of the standard implementation stages of an ERP system was done. A study on the effective use and the resultant effects on the business as a whole were evaluated through the use of questionnaire survey conducted at the company at different levels and in different functional areas. The survey highlighted weakness on the reporting systems in terms of the Key Performance Indicators such as Overall Equipment Effectiveness (OEE), Customer Case Fill on Time (CCFOT), Raw Material (RM) and Packaging Material wastage (RM and PM wastage). The paper concludes by showing a customised module developed to answer to difference in reports to the Key Performance Indicators used by the company.
1 INTRODUCTION:

The global market is a very dynamic and competitive one. For one to make it, they have to provide a service or products that are second to none. The paper outlines the importance of an ERP system in integrating the functions of a business into one, and enhancing visual and effective communication between them in order to improve company performance. The paper highlights the standard implementation stages of an ERP system and its effective use and the resultant impact on the business performance. The paper also outlines a computer program that can be used as an accurate solution for measuring and reporting key performance indicators such as Overall Equipment Effectiveness (OEE), Customer Case Fill on Time (CCFOT), Raw Material (RM) wastage and Packaging Material (PM) wastage. These key performance indicators are critical to responding changes in the market and in ensuring that the right product is delivered on time, in correct quantities, with acceptable quality and at a reasonable price.

1.1 Aim

The aim is to assess the impact of SAP ERP implementation and development of customised Performance Indicator Modules cost effectively.

1.2 Objectives

The objectives of the project were:

- To assess the Impact of Implementation of SAP Enterprise Resource Planning system.
- Develop a mass balance System for Packaging and Raw material usage from SAP database and customised performance modules for CCFOT and OEE.

1.3 Background

Today’s global market place is characterized by stringent regulations, higher operating costs, scarcity of resources and strict demands from increasingly informed customers. In such a dynamic and competitive environment, there is a need to develop systems and products that are significantly more flexible and responsive than existing ones. Zimbabwe’s manufacturing industry is no exception, there is need for instant feedback, traceability, uniformity and transparency. These as some of the critical factors in making key decisions and in eliminating loop holes in reporting results such as manipulation and bias that hinder fast and effective decision making. The systems that are being used presently lack adequate integration; a situation which hinders manufacturers from fully exploiting market opportunities because production plans and actual production cannot be quickly adjusted to suit changes in each other. With the influx of imported products, local manufacturers need to find means to reduce production waste in order to control cost and quality, and therefore remain competitive. There is need to allow for open communication within and between all company functions. There is need for instant feedback to achieve high Customer Case Fill On Time (CCFOT).

1.4 Methodology

A case study was chosen from a number of companies that have implemented ERP of different type in Zimbabwe. A full list of the companies that have implemented ERP systems are listed in Table 1. Within the case study company the following was undertaken:

- A survey on the implementation of the ERP systems within different functional area of the company and the different functional levels was done through questionnaires.
- Customisation of performance modules and analysis of performance was done using high level programming language to cover the gap in the ERP system.
### Table 1 Companies that have implemented ERP systems in Zimbabwe

<table>
<thead>
<tr>
<th>Company</th>
<th>Type of Enterprise Resources Planning Software</th>
<th>Status of Implementation</th>
<th>Enterprise Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimbabwe Revenue Authority (ZIMRA)</td>
<td>SAP Business Suite (R/3)</td>
<td>Implemented</td>
<td>Large Size Company</td>
</tr>
<tr>
<td>British American Tobacco (BAT) Zimbabwe</td>
<td>SAP Business Suite (R/3)</td>
<td>Implemented</td>
<td>Large Size Company</td>
</tr>
<tr>
<td>Unilever South East Africa (SEA)</td>
<td>SAP Business Suite (R/3)</td>
<td>Implemented</td>
<td>Large Size Company</td>
</tr>
<tr>
<td>Telone</td>
<td>SAP Business Suite (R/3)</td>
<td>Implemented</td>
<td>Large Size Company</td>
</tr>
<tr>
<td>Zimbabwe Electricity Supply Authority (ZESA)</td>
<td>SAP Business Suite (R/3)</td>
<td>Acquired Recently and Implementing</td>
<td>Large Size Company</td>
</tr>
<tr>
<td>Hwange Colliery Company Limited (HCL)</td>
<td>SAP Business Suite (R/3)</td>
<td>Have been using but not fully</td>
<td>Large Size Company</td>
</tr>
<tr>
<td>Grain Marketing Board</td>
<td>SAP Business Suite (R/3)</td>
<td>Have been using but not fully</td>
<td>Large Size Company</td>
</tr>
<tr>
<td>Dairibord</td>
<td>SAP Business All-in-One</td>
<td>Implemented</td>
<td>Medium Size Company</td>
</tr>
<tr>
<td>Tetrad</td>
<td>SAP Business All-in-One</td>
<td>Implemented</td>
<td>Medium Size Company</td>
</tr>
<tr>
<td>Sakunda Energy</td>
<td>SAP Business All-in-One</td>
<td>Implemented</td>
<td>Medium Size Company</td>
</tr>
<tr>
<td>Zimbabwe Mineral Development Corporation (ZMDC)</td>
<td>SAP Business All-in-One</td>
<td>Implementing</td>
<td>Medium Size Company</td>
</tr>
<tr>
<td>Nestle Zimbabwe</td>
<td>SAP Business All-in-One (customised version)</td>
<td>Implemented</td>
<td>Medium Size Company</td>
</tr>
<tr>
<td>Savanna Tobacco</td>
<td>SAP Business One</td>
<td>Implemented</td>
<td>Small to Medium Size Enterprise</td>
</tr>
</tbody>
</table>

#### 1.5 Case Study Company

It’s a large size company which has implemented SAP Business Suite (R/3). Like all the companies in Zimbabwe the company was affected by the economic meltdown but maintained operations at minimum level. As the economy began to pick up there was need to put in place systems that support survival in the global market. The move was implementation of ERP system SAP Business Suite (R/3) to integrate all functional areas and be still able to measure them using international World Class Performance standards such as Overall Equipment Effectiveness (OEE) and Customer Case Fill On Time (CCFOT).

#### 1 ENTERPRISE RESOURCE PLANNING (ERP)

Systems or enterprise systems are software systems for business management, encompassing modules supporting functional areas such as planning, manufacturing, sales, marketing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, transportation and e-business. The architecture of the software facilitates transparent integration of modules, providing flow of information between all functions within the enterprise in a consistently visible manner. Corporate computing with ERPs allows companies to implement a single integrated system by replacing or reengineering their mostly incompatible legacy information systems. An ERP system has been defined as a method for the effective planning and controlling of all the
resources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service company [1].

From a business perspective, ERP today has expanded from simply coordinating manufacturing processes to being the integrator of enterprise-wide backend processes. ERP has also evolved technologically from a monolithic legacy implementation into flexible, tiered, client-server architecture [2]. An ERP system typically has modular hardware and software units and "services" that communicate on a local area network. The modular design allows a business to add or reconfigure modules (perhaps from different vendors) while preserving data integrity in one shared database that may be centralized or distributed. Figure 1 gives a summary of an ERP.

![Figure 1 ERP systems concept [2]](image)

1.6 Implementation of an ERP System

Implementing an ERP system is not an easy task to achieve, in fact it takes lots of planning, consulting and in most cases three months to one year. Implementation of ERP systems requires a substantial investment in time, money and internal resources and is fraught with technical and business risk. ERP systems are extraordinary wide in scope and for many larger organizations can be extremely complex. Implementing an ERP system will ultimately require significant changes on staff and work practices. While it may seem reasonable for an in house IT staff to head the project, it is widely advised that ERP implementation consultants be used, due to the fact that consultants are usually more cost effective and are specifically trained in implementing these types of systems. A typical ERP installation has a total cost of about $15 million [3] and costs can be as high as 2-3% of revenues [4]. Installation takes between 1 and 3 years (21 months on average), with benefits starting to accrue in an average of 31 months [5].

One of the most important traits that an organization should have when implementing an ERP system is ownership of the project. Because so many changes take place and its broad effect on almost every individual in the organization, it is important to make sure that everyone is on board and will help make the new ERP system a success.

Usually organizations use ERP vendors or consulting companies to implement their customized ERP system. There are three types of professional services provided when implementing an ERP system and these are:
1. Consulting Services - responsible for the initial stages of ERP implementation. They help an organization go live with their new system, with product training, workflow, improve ERP's use in the specific organization, etc.

2. Customization Services - responsible for extending the use of the new ERP system or changing its use by creating customized interfaces and/or underlying application code. While ERP systems are made for many core routines, there are still some requirements that need to be built or customized for an organization.

3. Support Services - include both support and maintenance of ERP systems in terms of trouble shooting and assistance with ERP issues.

1.6.1 Critical Success and Failure Factors (CSFF) of ERP Implementations

When ERP software fails, it is usually because the company did not dedicate enough time or money to training and managing culture-change issues. “Faulty technology is often blamed, but eight out of nine times, ERP problems are performance related,” says Pat Begley, senior vice president of educational services at SAP [6].

A process theory approach was used to classify the CSFFs identified [7]. The process theory focuses on the sequence of events leading up to implementation completion. Markus and Tanis [5] identified the following four phases in an ERP life cycle:

1. The chartering phase comprises decisions leading to funding of the ERP system project. Key players in the phase include vendors, consultants, company executives, and IT specialists meet. Key activities include initiation of idea to adopt ERP, developing business case, and decision on whether to proceed with ERP or not, initiation of search for project leader/champion, selection of software and implementation partner, and project planning and scheduling [7].

2. The project phase comprises of system configuration and rollout. The key players include the project manager, project team members (mainly from business units and functional areas), internal IT specialists, vendors, and consultants or the implementation partners. Key activities include software configuration, system integration, testing, data conversion, training, and rollout. In this phase, the implementation partners must not only be knowledgeable in their area of focus, but they must also work closely and well together to achieve the organizational goal of ERP implementation [7].

3. The shakedown phase refers to the period of time from "going live" until "normal operation" or "routine use" has been achieved. Key activities include bug fixing and rework, system performance tuning, retraining, and staffing up to handle temporary inefficiencies. In this phase, the errors of prior causes can be felt, typically in the form of reduced productivity or business disruption [7]. Hence, it is important to monitor and constantly make adjustments to the system until the "bugs" are eliminated and the system is stabilized.

4. The onward and upward phase refers to ongoing maintenance and enhancement of the ERP system and relevant business processes to fit the evolving business needs of the organization. It continues from normal operation until the system is replaced with an upgrade or a different system. Key players include operational managers, end users, and IT support personnel (internal and external). Vendor personnel and consultants may be involved when upgrades are concerned. Key activities include continuous business improvement, additional user skill building, upgrading to new software releases, and post implementation benefit assessment [7].

1.6.2 Top reasons of failures with ERP

Why ERP implementations fail? In a recent survey, information technology managers identified three primary reasons for the failure of all IT-related projects: poor planning or poor management, change in business goals during the project, and lack of business management support. Since ERP is an IT-related project, the above are valid reasons for
explaining ERP implementation failures. But more specifically, ERP implementation failures fall into thirteen categories but below are six [7, 8]:

1. **Top management support** should be strongly committed to the system, if the management does not foresee and plan for the profound changes necessitated by ERP, or does not actively participate in the implementation, the implementation has a high likelihood of failure. The implementation of ERP must be viewed by top management as a transformation in the way the company does business. This can be achieved by tying management bonuses to project success. Top management needs to publicly and explicitly identify the project as a top priority. Senior management must be committed with its own involvement and willingness to allocate valuable resources to the implementation effort. This involves providing the needed people for the implementation and giving appropriate amount of time to get the job done. Managers should legitimize new goals and objectives. A shared vision of the organization and the role of the new system and structures should be communicated to employees. New organizational structures, roles and responsibilities should be established and approved. Policies should be set by top management to establish new systems in the company. In times of conflict, managers should mediate between parties.

2. **Unrealistic expectations and effective communication**, many companies grossly underestimate the amount of resources, time, and outside assistance required to implement and run the new system. Expectations at every level need to be communicated. Management of communication, education and expectations are critical throughout the organization. User input should be managed in acquiring their requirements, comments, reactions and approval. Employees should be told in advance the scope, objectives, activities and updates, and admit change will occur. Moreover, managers and workers frequently assume that performance will begin to improve immediately because the new system is complex and difficult to master; organizations must be prepared for an initial decline in productivity after the new software is put into operation. As familiarity with the new system increases, the expected improvements will come. But management must be prepared for initial waves of frustration.

3. **Project management** managers are often surprised by the scope, size, and complexity of an ERP implementation. As a result, management sometimes does not initiate the necessary level of detailed project management planning and control. Good project management is essential. An individual or group of people should be given responsibility to drive success in project management. The scope must be clearly defined and be limited. This includes the amount of the systems implemented, involvement of business units, and amount of business process reengineering needed. Any proposed changes should be evaluated against business benefits and, as far as possible, implemented at a later phase. Additionally, scope expansion requests need to be assessed in terms of the additional time and cost of proposed changes.

4. **Adequate education and training**, top managers and all system users must be fully educated so they understand how the ERP system should be integrated into the overall company operation. All users must be trained to take full advantage of the system's capabilities. A failure to educate and train all relevant personnel will guarantee implementation problems.

5. **Data accuracy** of the data entered into an ERP system is necessary as the information may be used throughout the organization. If inaccurate data is entered into the common database, because of the integrated nature of ERP, the erroneous data may have a negative domino effect throughout the enterprise. Inaccurate data can lead to errors in market planning, production planning, material procurement, capacity acquisition, and the like. If a company with inaccurate data just forge ahead under the assumption that data errors will be corrected when they are spotted, the ERP will
lose credibility. This encourages people to ignore the new system and continue to run the company under the old system.

6. **Business Plan and Vision** should be clear to steer the direction of the project and is needed throughout the ERP life cycle. A business plan that outlines proposed strategic and tangible benefits, resources, costs, risks, and timeline is critical. This will help keep focus on business benefits. There should be a clear business model of how the organization should operate behind the implementation effort. There should be a justification for the investment based on the problem and the change tied directly to the direction of the company. Project mission should be related to business needs and should be clearly stated. Goals and benefits should be identified and tracked. The business plan will make work easier and impact on work.

1.7 **ERP Implementation stages**

The ERP implantation stages can be categorised into five major stages as viewed for SAP implementation of a multinational company venturing in the manufacture of basic commodities and are summarised in Figure 2.

![Figure 2: SAP Implementation stages [9]](image)

Key Events and timelines of the implementation is summarised in Figure 3 and often depend with the size of the Organisation and the magnitude of the project.

1.8 **Key Performance Indicators (KPI)**

Key Performance Indicators are quantifiable measurements, agreed to beforehand, that reflect the critical success factors of an organization. They will differ depending on the organization. Whatever Key Performance Indicators are selected, they must reflect the organization's goals, they must be key to its success, and they must be quantifiable (measurable). Key Performance Indicators usually are long-term considerations. The definition of what they are and how they are measured do not change often. The goals for a particular Key Performance Indicator may change as the organization's goals change, or as it gets closer to achieving a goal. If a Key Performance Indicator is going to be of any value, there must be a way to accurately define and measure it. There is also need to set targets for each Key Performance Indicator.

1.8.1 **Overall Equipment Effectiveness (OEE)**

Overall Equipment Effectiveness (OEE) is a key measurement of efficiency in manufacturing processes (at machine, manufacturing cell or assembly line levels). This is a measure of the operational performance of the production lines. It considers three performance indicators based on the losses defined by the Global TPM Corp [11]. Maximising equipment efficiency means making it work as well as it possibly can by eliminating all the losses that prevent this.
1.8.2 How to calculate Overall Equipment Efficiency (OEE)

OEE calculation is based on three contributing factors, Availability, Performance, and Quality [12].

1. **Availability**: is the time the equipment actually operates, expressed as a percentage of the time for which it is available.

   \[
   Availability = \frac{\text{Loading time} - \text{Down time}}{\text{Loading time}} \quad (1)
   \]

   \[
   Availability = \frac{\text{Actual Production time}}{\text{Planned time}} \quad (2)
   \]

   Downtime is time during which the equipment is at a standstill due to breakdown, setup, adjustment, cutting tool replacement and so on.

2. **Performance**: takes into account Speed Loss and indicates whether the equipment is actually operating as fast as it should (i.e., at the standard speed or cycle time).

   \[
   Performance = \frac{\text{Current run rate}}{\text{Ideal run rate}} \quad (3)
   \]

   \[
   Performance = \frac{\text{Pieces produced}}{\text{Operating time} \times \text{Ideal Cycle time}} \quad (4)
   \]

   **Ideal Cycle Time** is the minimum cycle time that your process can be expected to achieve in optimal circumstances. It is sometimes called Design Cycle Time or Theoretical Cycle Time.

3. **Quality**: is the quantity of acceptable product produced, as a percentage of the quantity of product processed. Defectives include product to be reworked or discarded.

   \[
   Quality = \frac{\text{Good pieces produced}}{\text{Total pieces produced}} \quad (5)
   \]

   The various losses affecting equipment efficiency calculated as described above can now be multiplied together to give an overall indication of how effectively the equipment is being utilised. The resulting percentage is called the OEE and is calculated as follows:
\[ OEE = \text{Availability} \times \text{Performance} \times \text{Quality} \]  \hfill (6)

OEEs calculated in this way are generally found to be in the range of 50% to 60%, before the equipment is improved. Table 2 below shows World Class OEE standard [13].

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability</td>
<td>90%</td>
</tr>
<tr>
<td>Performance</td>
<td>95%</td>
</tr>
<tr>
<td>Quality</td>
<td>99.9%</td>
</tr>
<tr>
<td>OEE</td>
<td>85%</td>
</tr>
</tbody>
</table>

### 1.8.3 Customer Case Fill On Time (CCFOT)

As a company moves ahead to be the best in class, globally, it is important to adopt a measurement, understood by all, consistent throughout the organisation and more accurately reflects its performance from the customer’s perspective. CCFOT and the associated Loss Tree approach is a tool not only to measure how a company is doing, but also to provide with the information which highlights the overall losses to customers. Losses can then be analyzed to determine the root causes and subsequent improvement actions. For CCFOT accurate calculation it depends on implementation and link within ERP systems which needs to be customised [13].

### 1.8.4 Objectives of CCFOT

The objectives of CCFOT are to: enable a consistent method for measuring customer service (from Company to the customer delivery point) across the company; provide a mechanism for root cause analysis and continuous improvement; enable measurement of customer service as seen by the customer; provide a common mechanism for sharing performance and major losses, to facilitate sharing of best practice [14].

### 1.8.5 Principles of CCFOT

The principles of CCFOT are:

1. Measure against unconstrained customer order/replenishment need:
2. Measure our ability to deliver on-time to customer’s needs:
   - ‘On time’ granularity to be defined by country
   - Recommended by channel (or customer where relevant)
3. Measure all the losses – internal and external:
   - Some losses will be due solely to customer behaviour (which we can influence!)
   - Establish action plans in place for top loss areas
4. Recognition that the measure is not perfect but should substantially achieve our objectives.
5. Measure collective performance with CCFOT KPI;
   - Target our people where possible on loss reduction, not on CCFOT KPI performance.
   - CCFOT becomes one measure of the health of our relationship with the customer and does not reflect individual performance.

### 1.8.6 CCFOT Calculations

Assuming that the customer orders 1000 cases and we are short 200 cases because we are out of stock. If we ship 800 cases and all of the cases are delivered to the customer on time.
The customer really wanted 1000 cases. The loss of 200 cases in CCFOT is shown in Equation (7).

\[
CCFOT = \frac{\text{Total number of cases shipped}}{\text{Total number of cases ordered}} \times \frac{\text{Total number of cases delivered on time}}{\text{Total number of cases shipped}} = 80\% \tag{7}
\]

1. Total number of cases ordered refers to the cases which the customer really needs regardless of their availability or the integrity of the order (i.e. if the customer orders are discontinued SKU, the measurement will be impacted).
2. Total number of cases shipped are those cases shipped from the warehouse
3. Total number of cases delivered on time is based on the customer’s requirements (i.e. the requested delivery date and appointment time, as agreed with or provided by the customer), such as:
   - If specific delivery dates are not agreed with the customer, then standard delivery lead times should be utilized.
   - Orders “picked-up” by the customer (i.e. back-haul) should be measured against on-time pick-up. Late pick-ups by the customer will therefore impact CCFOT.

1.8.7 Raw Material & Packaging Material (RM&PM) wastage

1. Raw materials waste is illustrated in Equation (8):

\[
\text{Raw material waste} = \frac{\text{Actual raw material cost} - \text{Zero based raw material cost}}{\text{Zero based material cost}} \times 100\% \tag{8}
\]

This Considers:

i) The Make process and therefore does not include obsolescence, stock write-offs etc.
ii) The actual raw materials cost should not include consumables such as Bleaching earth, catalysts which should be considered as part of the production cost
iii) The Zero Based raw materials cost should not include the traditional BOM material wastage allowances.
iv) In categories where there are by-products produced as part of the production process (E.g. SCC and Toilet Soaps) this positive credit should be added onto the Actual Raw Material Cost. This does not include rework inside the factory or residues.
v) No allowance is to be made for over-packing, washouts, etc. as these are waste and therefore should not be shown in the zero based raw material consumption figure.
vii) This measure must be based on the Standard material cost, not the moving average price.

2. Packaging and Raw material Cost

This measure enables an understanding of Packaging Materials waste within the Make process and shown in Equation (8):

\[
\text{Packaging waste} = \frac{\text{Actual packaging material cost} - \text{Zero based packing material cost}}{\text{Zero based packaging material cost}} \times 100\% \tag{9}
\]

This Considers:

1. The Make process and therefore does not include obsolescence, stock write-offs etc.
2. The Zero Based packaging Material costs should not include the traditional BOM material wastage allowances
3. No allowance is to be made for packing removed from poor product etc. as this is waste and therefore should not be shown in the zero based packaging material consumption figure.
4. The packaging materials cost should exclude material used for trials and pilot plant.
5. This measure must be based on the Standard material cost, not the moving average price.

SAP uses Certificates of analysis to approve receiving of raw and packaging materials this ensures the received items are within the required specifications moreover managing processes ensures we have limited rework as we manage our equipment that might result in excess use of the input resources. The combined raw material and packaging material form is known as mass balance which is very important in analysing how efficient the conversion process is.

2 IMPLEMENTATION RESULTS

A total of sixteen questionnaires were sent via email targeting the key personnel that was directly involved with the use of the ERP and Management who would use the results for decision making. These key personnel also were related to the KPIs that the company used and would want to use as they measure themselves as a World Class Company. The people involved were from the following functional areas: Buying, Production Planning, Quality, Sales, Finance and Marketing.

2.1 Results from Users

The following questions to evaluate the uses of ERP in terms of the importance comparing to the previous system. The following key was used and the responses are summarised in Figure 4. The Likert scale was used where 5-very important, 4-moderately important, 3-little important, 2-very little important and 1-not important. Some of questions were:

A- Is there software flexibility in respond to the changes in the company’s processes?
B- Does the ERP software functionality satisfy the company’s business processing requirements?
C- What degree of business process standardization did you achieve?
D- Is there “ease of use” of the ERP system modules?
E- Is there completeness in reporting?

![Figure 4: Comparisons between Old and new system implemented](image)

Figure 5 shows a summary of training workshops attended by various users from different departments.
The attendance depend on the function and intensive association of the user with the system and 62.5% of the users were satisfied with the workshops they attended despite the fact that a few issues included language, length of the workshop and equipment available were raised. All the users opted for the new system compared to the old mainly because of less work they will have to do and easiness of the new system.

2.2 Results from Management Level

The following questions were extracted specifically for the Management level and the responses are summarised in Figure 6:

A- Has the business deviated in any way from these goals?
B- Were the expectations very realistic in terms of time frame to complete tasks?
C- Were the time frames properly communicated?
D- During chartering phase did ideas towards customisation come from all plants?
E- During implementation did any significant technical difficulties arise (i.e. bugs)?
F- During the shakedown phase (period of going Live) what major challenges have been faced?

![Figure 5: Training Workshops Attended](image)
Figure 6: Responses from the Management Level on Implementation activities

The weakness in the new system was in reporting KPIs in the format of that the company uses like OEE and CCFOT thus the need to develop customised modules explain in Section 3.

3 KPI CUSTOMISATION RESULTS

The following are interfaces of customised Key Performance Indicator calculations. Figure 7 shows the material waste and its associated cost for manufacturing a certain product while

Figure 7: Material waste calculation interfaces

Figure 8 shows interface for OEE measure and Figure 9 is for CCFOT calculation and its associated lost sales cost. Once the period in question is inputted the system automatically reads the tonnage produced for those days and the current stock levels that is the stock for the initial date as the opening stock and the stock to the final date as the closing stock. The user now has to prompt the command button by clicking them to obtain desired outputs as per the system calculations but sequence should always be observed like in general mathematics calculations.

The input of the period in question and SKU will prompt value into other various text boxes automatically from the Database and hence command buttons will be used to come up with the rest of the values in sequential order.
Once the date is specified the system will automatically calculate the demand of the period, show the deliveries made and the on time deliveries. Calculation of the CCFOT for the required period is done by click of the CCFOT button.

4 CONCLUSION

Having a good ERP system is very essential part of any organisation but eventually what matters most is what data is being provided to decision makers. Customisation might look cost effective at the implementation stage but in fact may prove to be expensive in later years due to maintenance and upgrade hence it should be ideal to be able to customise your own system where possible. The success of implementation should thus be measured against the goals originally stated at the time of initiation of project and thus will depend per organisation, but generally things like labour cost relative to revenue and profits, data availability, quality, responsiveness to customer and efficiency must improve
5 ACKNOWLEDGEMENTS

The authors are grateful to Case Study Company for their full support in the research. They are also thankful to the National University of Science and Technology for all the support in the research project.

6 REFERENCES


