Evaluation of the SAP R/3 system implementation using optimized modules (Case study: Chemicals company)

T G Amran¹,² and S Yuniati¹,³

¹University of Trisakti, Kyai Tapa No.1 - Grogol, 11440, Indonesia
E-mail: ²amran.tiena@gmail.com; tiena@trisakti.ac.id, ³sriyuniati@yahoo.com

Abstract. This study evaluates the SAP R/3 System Implementation through optimization of modules in resin chemicals industry. The company has implemented SAP R/3 software since 2013, but 62% of it has not been adjusted and need to be evaluated for implementation performance, therefore it is unknown whether SAP already reached its optimum point. Therefore, SAP R/3 evaluation is needed through SY Check List, improvement of forecasting, and Material Requirement Planning (MRP). The chosen product that was calculated was the A category product by ABC analysis. The 6 periods (months) forecasting will be used as a base of Master Production Schedule (MPS) to calculate the raw material requirement. The MRP calculation method used Lot-For-Lot because it does not need price information. SY Check List was used to identify in-optimum modules which SAP provided beforehand. The suggestion made based on the best forecasting calculation was used as other A category products forecasting calculation method. Therefore, SY Check List optimized SAP modules not only as a book data, but also logistic as integrated system which have to be maximized. As actual demand fluctuation forecasting method should be changed. More accurate forecasting will define MRP parameters accuracy.

1. Introduction
Choosing and implementing the ERP-SAP (Enterprise Resource Planning-System Application and Processing) in chemical company from the head office to subsidiaries in Tokyo is aimed to integrate the whole logistic information system. Therefore, the data collection, controlling and monitoring are directly conducted by using global template. A similar and holistic system must be implemented to all subsidiaries around the world as soon as possible in Information System (IT) technology and this information system will process the business into a new one. In the computer-based information system, Enterprise Resource Planning (ERP) is connected to the software of information system technology [1]. ERP is a concept that integrates all function in the business process of the company in a single database, so that each function of each different department in a company can share information to each other in a better way. The main factors of successful ERP implementation are teamwork and composition, Change Management program and Culture, top management support, business plan and vision, business process reengineering with minimum customization, project management, and software development, testing and troubleshooting [2].

Offering a comprehensive information management system for organizations, ERP is aimed to integrate various business processes by eliminating redundant elements while enabling data sharing between business functions. Coordination of planning activities, global and geographic audit of the organization, and the integration of top-level information can be achieved through ERP. ERP is a system that uses the most advanced information technology that responds to all these needs [3]. The ERP system successfully benefits the rationalization, standardization, fault reduction and cost reduction process [4]. In the opposite case, the inability to create an effective ERP system will not only lead to cost and time losses, in addition, the ERP can cause serious losses by causing damage to the company's culture, minimizing production, introducing excessive training needs, and misleading customer demand [5].

The problem is before the use of ERP-SAP the old system BaaN is one part of the production management division of the company, Invensys PLC [4]. This transition period finds that (1) there are
inaccuracies in detecting raw material input that is consumed by the system, (2) there is an inability to trace the quantity of inputs and the output of the system, (3) the old system cannot export the data directly but a modifier system named Crystal Report must be available, (4) Purchase Requisition (PR) or request of raw materials to Purchasing section are still using Ms. Excel, and (5) the MRP module is not permitted to be used due to the purchase/rental package. The purpose of this research is to evaluate the SAP R/3 implementation at operational level with SY Check List approach to improve forecasting, MPS and MRP.

2. Methods
The methodology and research framework of this research is shown in Figure 1.

| Input | Problem | Process | Analysis | Design | Output | Validation |
|-------|---------|---------|----------|--------|--------|------------|
| Forecasting and Forecasting (2012 and 2013 are still high. The average of MAPE (Mean Absolute Percentage Error) actual vs forecast are 2012: 5% and 2013: 9% for all product sales. It adds doubts to upload the sales forecast into SAP. | Create the ABC analysis data and choose one product which forecasting to be counted. | Calculate Material Requirement Planning (MRP) for the product with the Lot-For-Lot method based on the results of the selected forecasting. | Getting the best forecasting model with the smallest error. | SY Check List Data creation to optimize SAP R/3 usage. | Actual Demand Data. |
| Forecasting (2012 and 2013 are still high. The average of MAPE (Mean Absolute Percentage Error) actual vs forecast are 2012: 5% and 2013: 9% for all product sales. It adds doubts to upload the sales forecast into SAP. | Product selection which to be counted is the product of category A with increased sales growth (up-trend). | Obtain raw material request data from LPI. MRP and compared with quantity of raw material order in Company's version (Excel). | Forecasting data for the next 6 months in 2014 compared to forecasting data and actual version of the sales. | SY Check List Data creation to optimize SAP R/3 usage. | Forecasting model for classification A. |
| Forecasting (2012 and 2013 are still high. The average of MAPE (Mean Absolute Percentage Error) actual vs forecast are 2012: 5% and 2013: 9% for all product sales. It adds doubts to upload the sales forecast into SAP. | Improve sales forecast by finding the best forecasting method. | Limited knowledge of forecasting and MRP modules in SAP R/3 MRP parameters, such as lead-time, lot size, etc. must be controlled periodically according to changes. | SY Check List Data creation to optimize SAP R/3 usage. | SY Check List Data creation to optimize SAP R/3 usage. | SY Check List. |

Figure 1. Methodology and research framework.

3. Results and Discussion
The option of switching and using the SAP in Table 1, there are many modules obtained that have not been in BaaN but can be accommodated in SAP R/3. This condition has not been optimally enabled by the company because the sales forecasting accuracy is unsure. Forecasting mistakes can lead to overstock or out of stock. Therefore, it is necessary to calculate the planning of sales more accurately so that the calculation result can be uploaded to SAP R/3. Calculation results of the forecasting are used to calculate the needs of raw materials (MRP).

SAP R/3 system was adopted more frequently compared to BaaN (Figure 2), as for example: (1) Sales which consisted of master data, sales, shipping, billing, (2) PPIC which consisted of basic data, capacity requirement planning, repetitive manufacturing, master planning, reduction orders, material requirement planning, warehouse management, (3) Accounting which consisted of inventory management, general ledger, account receivable, account payable, product cost controlling, (4) Purchasing which consisted of raw material order processing, packaging processing, trading goods, return processing, (5) Technical which consisted of technical trial, material master, and (6) QC which consisted of inspection processing, quality control and quality certificate. Meanwhile, human resource data such as attendance, leave, payroll has yet to use SAP R/3 system.
Figure 2. Flow chart process and information system SAP/R3 in chemical company.

Table 1. Comparisons of total modules of transaction coverage between BaaN and SAP.

| Module                                      | BaaN | SAP | Module                                      | BaaN | SAP |
|---------------------------------------------|------|-----|---------------------------------------------|------|-----|
| Basic Data (PP-BB)                          | O    | O   | Material Requirement Planning (MM-MRP)      | X    | O   |
| Sales and Operation Planning (PP-SOP)       | O    | O   | Purchasing (MM-PUR)                        | O    | O   |
| Master Planning (PP-MP)                     | X    | O   | Inventory Management (MM-IM)                | O    | O   |
| Capacity Requirement Planning (PP-CRP)      | X    | O   | Warehouse Management (MM-WM)                | O    | O   |
| Material Requirement Planning (PP-MRP)      | X    | O   | Invoice Verification (MM-IV)                | O    | O   |
| Production Orders (PP-MRP)                  | O    | O   | Information System (MM-IS)                 | O    | O   |
| Product Costing (PP-MRP)                    | O    | O   | Electronic Data Interchange (EDI)           | X    | X   |
| Kanban/JIT Production (PP-MRP)              | X    | X   | Bill of Material                            | O    | O   |
| Repetitive Manufacturing (PP-REM)           | X    | O   | Cost Price Calculation                      | O    | O   |
| Assembly Orders (PP-ATO)                    | X    | O   | Engineering Change Control                  | X    | X   |
| Process Planning for Process Industry (PP-) | O    | X   | Engineering Data Management                 | X    | X   |
| Plant Data Collection (PP-PDC)              | O    | O   | Hours Accounting                            | O    | O   |
| Information System (PP-IS)                  | O    | X   | Product classification                      | O    | O   |
|                                            |      |     | Product configuration                        | O    | O   |
|                                            |      |     | Production control                          | O    | O   |
|                                            |      |     | Production Planning                         | O    | O   |
|                                            |      |     | Project Budgeting                           | X    | X   |
|                                            |      |     | Project Control                             | X    | X   |
|                                            |      |     | Repetitive Manufacturing                     | X    | O   |
|                                            |      |     | Routing                                     | O    | O   |
|                                            |      |     | Shop Floor Control                          | X    | O   |
|                                            |      |     | Tool Requirement Planning and Control        | X    | O   |
|                                            |      |     | Capacity Requirement Planning               | X    | O   |
|                                            |      |     | Master Product Scheduling                   | X    | O   |
|                                            |      |     | Master Requirement Planning                 | X    | O   |

SY Check List approach in Production Planning (PP), Material Management (MM), and Manufacturing (M) operations.
Table 1 explained the existing modules within the thirty-eight modules with BaaN and SAP/R3, 38% of the modules was suitable and 62% was unsuitable. In this research, module adjustments that will be evaluated is the Precom Chemicals case in Process Planning (PP), the forecasting improvement from sampling of one chosen product is done with ABC classification approach [6][7].

3.1. Graphs and Calculation of Selected Product Forecasting ABC Classification

Product selection which represent ABC classification approach prioritize materials with high product sales (Table 2).

| SAP Code     | Name                                | Actual Demand 2017 (Kg) | %   | Cumulative | Classification |
|--------------|-------------------------------------|-------------------------|-----|------------|----------------|
| 12999995706  | DK0190_BURNOCK ECL-341-PDJ          | 2,140,603               | 19% | 19%        | A              |
| 12999995598  | CK0018_DICDRY LX-830-PDC            | 1,018,766               | 9%  | 27%        | A              |
| 12999995752  | DK0220_POLYLITE DE-347-IM           | 954,360                 | 8%  | 36%        | A              |
| 12999995628  | DK0180_12X0020-P                    | 775,980                 | 7%  | 42%        | A              |
| 12999995722  | DK0230_POLYLITE FG-208              | 669,760                 | 6%  | 48%        | A              |
| 12999995613  | EK0224_PRECOMNBA-13P                | 660,820                 | 6%  | 54%        | A              |
| 12999995630  | DK0180_12X0921-AF                   | 483,300                 | 4%  | 58%        | A              |
| 12999995746  | DK0220_POLYLITE CN-225-SF           | 474,760                 | 4%  | 62%        | A              |
| 12999995754  | DK0220_POLYLITE DE-350              | 438,720                 | 4%  | 66%        | A              |
| 12999995783  | DK0180_Styrene Monomer             | 385,200                 | 3%  | 69%        | A              |
| 12999995733  | DK0230_POLYLITE CS-810-NW           | 289,800                 | 3%  | 72%        | A              |
| 12999995644  | CK0018_DICDRY LX-820-PD             | 279,654                 | 2%  | 74%        | A              |
| 12999995588  | DK0190_ACRYDIC A-418                | 250,800                 | 2%  | 76%        | A              |
| 12999995678  | CK0018_DICDRY LX-420A               | 240,678                 | 2%  | 79%        | A              |
| 12999995682  | CK0018_SP-75 D                      | 240,084                 | 2%  | 81%        | A              |
| 12999995709  | DK0230_POLYLITE BS-109              | 232,530                 | 2%  | 83%        | A              |
| 12999995632  | DK0180_12X1153-AF                   | 227,520                 | 2%  | 85%        | A              |
| 12999995735  | DK0220_POLYLITE KT-114              | 209,880                 | 2%  | 86%        | A              |
| 12999995674  | CK0018_SI-75 D                      | 204,736                 | 2%  | 88%        | A              |
| 12999995583  | DK0190_BECKOSOL PD-7300-S           | 204,440                 | 2%  | 90%        | A              |
| 12999995737  | DK0220_POLYLITE KT-114-HV           | 194,260                 | 2%  | 92%        | A              |
| 12999995606  | DK0190_BECKOLITE M-6401-50S         | 188,670                 | 2%  | 93%        | A              |
| 12999995516  | DK0190_ACRYDIC 52-473               | 181,654                 | 2%  | 95%        | A              |
| 12999995544  | DK0190_ACRYDIC FL-829D-50-PD        | 173,850                 | 2%  | 96%        | A              |
| 12999995471  | DK0190_ACRYDIC A-801-PHV            | 149,210                 | 1%  | 98%        | A              |
| 12999995666  | CK0018_DICDRY LX-405-A D            | 133,852                 | 1%  | 99%        | A              |
| 12999995728  | DK0230_POLYLITE TA-130              | 133,730                 | 1%  | 100%       | A              |

Example: Precom Product (classification A).

Figure 3. Trend graphs.

Figure 4. Control of difference between forecasting and actual delivery.

Figure 5. Tracking signal of upper and lower control limits.

Sales Forecasting MAD
Method Moving Average 8669
Single Exponential 9075
Smoothing Linear 5464

MAD in the Linear method is the smallest error value so that this forecasting method can be used to calculate demand plan in the next 6-month period

\[
MR = 6684.1 \\
UCL = 17779.58 \\
LCL = -17779.58
\]

Linear method forecasting is chosen and applied to products in classification A.
Figure 3 and 4 showed gaps in the actual forecasting of the company's demand and calculation by 110,456 kg. Whereas the linear method of forecasting is no difference, this approach is valid and can be used for Precom products. By assigning this data to the SAP R/3, hence the production needs are calculated automatically, the plan and purchase of raw materials eventually become a completely integrated system without manual calculations and the deviation rate errors resolved.

3.2. Material Requirement Planning (MRP) (Example: Classification A Products)

Precom product in A classification was chosen as sample in MRP forecast calculation (Table 3, Table 4, and Table 5) based on the performance as superior product and the availability of its raw materials must always be maintained. The growth trend of Precom product increases but it has yet to be a commodity, which resulted in lower number of competitors with similar product. Therefore, it is important to keep the product overstocking vice versa.

**MRP Calculation.**

| Table 3. Precom formula. | Table 4. PB-X formula. | Table 5. PB-Y formula. |
|-------------------------|------------------------|------------------------|
| Product Name | Raw Material | Total (Kg) | Intermediate Name | Raw Material | Total (Kg) | Intermediate Name | Raw Material | Total (Kg) |
| Precom | | | | | | | | |
| PB-X | 18 | | PB-X | G | 3000 | PB-X | G | 3000 |
| PB-Y | 25 | | | H | 1000 | | | |
| A | 6 | | | | | | | |
| B | 145 | | | | | | | |
| C | 30 | | | | | | | |

With the MRP Lot-For-Lot method, in the exploding stage for Level 0 (Precom Product), Level 1 (PB-X and PB-Y), and level 2 is for the raw material of PB-X forming, as in the Table 4. This MRP calculation result should be compared by Purchasing Requisition (PR) in SAP R/3.

3.3. Master Production Schedule (MPS)

Based on Linear method forecast (Figure 5), six future periods demand were calculated. This will be the basis of Master Production Schedule (MPS) arrangement (Table 6).

| Table 6. MPS precom 1st semester 2017. |
|-----------------------------|
| Item | Year 2017 |
|-----------------------------|
| Month | Jan | Feb | Mar | Apr | May | Jun |
| Period | 1 | 2 | 3 | 4 | 5 | 6 |
| EK0224 PRECOM NBA-13P | 70.051 | 71.627 | 73.203 | 74.779 | 76.355 | 77.931 |

3.4. Inventory Precom Status

This table shows the information of supply availability at the beginning of period 0.

| Table 7. Status inventory precom. |
|-----------------------------|
| Period | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Gross needs Dt | - | 70.051 | 71.627 | 73.203 | 74.779 | 76.355 | 77.931 |
| Acceptance of Orders Qt (IOO) | - | 71.680 | 71.680 | 71.680 | 71.680 | 71.680 | 71.680 |
| Available supplies (IOH) | 7.511 | 9.140 | 9.193 | 7.670 | 4.571 | (104) | (6.355) |

From the calculation in the Table 7, it is shown that in 5th and 6th period, the supply becomes -104 and -6355. Inventor in 5th month was 4571 – 76355 + 71680 = -104. This resulted in intermediate PB-Y shortage in fifth and sixth month and that need to be restocked since fourth or sixth month. For
Precom manufacture, raw material “G” was imported from Japan, which required 2 months of shipment time and “F” from Europe, which required 3 months of shipment. MRP calculation should be compared and proceeded as Purchasing Requisition (PR) in SAP R/3.

3.5. Lot-For-Lot Netting
At this stage, the net needs of Precom is calculated. The Table 8 shows that in the period 5th and 6th, Precom experienced a deficiency, so the net needs in months 5 and 6 is as much as the deficiency itself.

Table 8. LFL netting for precom.

| Periode t | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|---|---|---|---|---|---|
| Gross needs Dt | 70.051 | 71.627 | 73.203 | 74.779 | 76.355 | 77.931 |
| Acceptance of Orders Qt (IOO) | 71.680 | 71.680 | 71.680 | 71.680 | 71.680 | 71.680 |
| Available supplies It (IOH) | 9.140 | 9.193 | 7.670 | 4.571 | (104) | (6.355) |
| Net Needs (Rt) | 0 | 0 | 0 | 0 | 104 | 6.355 |

3.6. Lot-For-Lot Exploding
Once the net needs are obtained, the size of the reservation lot (lot size), and the lead time, then the next step is exploding for the product structure at level 0 and level 1 and the product level 2, which are intermediate PB-X and PB-Y (sample calculation). On the table is the exploding on the structure of the product level 2 with raw materials G and H.

Table 9. LFL exploding for level 2 (PB-Y).

| PB-Y : Level 1 (25 Kg) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|------------------------|---|---|---|---|---|---|---|
| Gross Needs Dt | 12 | 709 |
| Order received Qt (IOO) | 220 |
| Available supplies It (IOH) | 50 | 50 | 50 | 270 | 258 | 451 | 451 |
| Net needs (Rt) | 451 | 451 |
| Lot size (Qt) | 451 |
| Order Plan - POR | 451 | 451 |

| G : Level 2 (3000 Kg) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|------------------------|---|---|---|---|---|---|---|
| Gross needs Dt | 54106 | 54106 |
| Order received Qt (IOO) | 9720 | 9720 |
| Available supplies It (IOH) | 0 | 0 | 0 | 9720 | -34666 | -88772 | -88772 |
| Net needs (Rt) | 34666 | 88772 | 88772 |
| Lot size (Qt) | 34666 | 88772 | 88772 |
| Order Plan - POR | 34666 | 88772 | 88772 |

| H : Level 2 (1000 Kg) | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|------------------------|---|---|---|---|---|---|---|
| Gross Needs Dt | 18035 | 18035 |
| Order received Qt (IOO) | 2500 | 2500 | 2500 |
| Available supplies It (IOH) | 0 | 0 | 0 | 2500 | -13035 | -28571 | -28571 |
| Net needs (Rt) | 13035 | 28571 | 28571 |
| Lot size (Qt) | 13035 | 28571 | 28571 |
| Order Plan - POR | 13035 | 28571 | 28571 |

Table 9 displayed the exploding calculation in Level 2 product structure, which has been chosen as intermediate PB-Y.

3.7. SY Check List
On the Table 10 is a check list to record PPQM modules that have and have not been executed along with the information on which parts are responsible and the cycle of the checking.

SY Check List is a table to analyze whether the modules that have been charged to the user are executed properly and correctly according to their functions. From the table, SY Check List to PPQM
module is that the process number 1 to number 5, which is the process that the forecasting is obtained from the Sales department, should be uploaded until the raw materials monthly checking has not been done. This is because the PPIC part is still doubtful of the accuracy of the forecasting given by the sales section. Less accurate forecasting will result in inaccuracy of process number 3 and number 5. If the forecast from the Sales section forced to be uploaded to the SAP system, then the number of production plans indicated by the ZPPP_R0007 and the amount of raw materials needed in the aggregate becomes doubted to be used as the basis of execution.

Table 10. SY check list for PPQM module.

| No | Transaction Code | Process Definition | Done/ Undone | Remark | Dept in Charge | Checking Cycle |
|----|------------------|--------------------|-------------|--------|---------------|----------------|
| 1  | ZEPP_R0001       | Forecast Upload    | ✓           |        | PPIC          | Monthly        |
| 2  | MD40             | MPS Run            | ✓           |        | PPIC          | Monthly        |
| 3  | ZPPP_R0007       | Monthly production Planning report | ✓ |        | PPIC          | Monthly        |
| 4  | MD01             | MRP Run            | ✓           |        | PPIC          | Monthly        |
| 5  | ZPPP_R0008       | Monthly production Planning report | ✓ |        | PPIC          | Weekly         |
| 6  | ME51N            | Create Purchasing Requisition | ✓ | Individual Running | PPIC          | Daily          |
| 7  | ME55             | Release Purchasing Requisition | ✓ | Individual Running | PPIC          | Daily          |
| 8  | MD64             | Check stock requirement list | ✓ | Individual Running | PPIC          | Weekly         |
| 9  | MDVP             | Check Planned order availability | ✓ | Individual Running | PPIC          | Daily          |
| 10 | MD04 / COR7      | Convert Planned order to Process order | ✓ | Individual Running | PPIC          | Daily          |
| 11 | COR1             | Create Process Order | ✓ | Individual Running | PPIC          | Daily          |
| 12 | ZPPP_E0004       | Release Pr. Order + Make ticket & QC ticket printing | ✓ | Individual Running | PPIC          | Daily          |
| 13 | CORK             | Process order Confirmation | ✓ | Individual Running | Production | Daily          |
| 14 | COGI             | Process order Confirmation errors | ✓ | Individual Running | Production | Daily          |
| 15 | QA32             | Record Inspection Result | ✓ | Individual Running | Quality       | Daily          |
| 16 | QA32             | Record UD           | ✓ | Individual Running | Quality       | Daily          |
| 17 | COR2             | Technically close the Process order | ✓ | Individual Running | Production | Weekly         |

In process number 9th and 10th, it is a direct effect that occurs if process number 1 until number 5 is not executed. If the forecast is not uploaded to SAP, then the planned order will not be automatically generated by SAP. So, to make the used process order as a command for product creation to the production section, it is created from the COR1 module directly. Currently, what takes place in the company is production plans and raw material needs are calculated with Ms. Excel. The planned production will be realized, directly created in COR1. While the raw material plan to be ordered is made directly at ME51N. With the existing MRP facility in SAP R/3 it will work optimally, bearing in mind that there are hundreds of raw materials.

3.8. Design and Modeling of SY Check List

Design and modeling of SY Check List is created to identify which modules have and have not been executed during the application of SAP R/3. This identification is limited only to the Production Planning module. These design parameters of SY Check List include:

1. **Transaction Code**: A transaction code is used to enter the SAP R/3 Module window.
2. **Process Definition**: A detailed description of the transaction name in the opened window.
3. **Done/ Undone**: The marking (check list) of any transaction code that have or have not been executed by company.
4. **Remark**: A description field that contains information if this transaction code is executed individually (individual running).
5. **Dept in Charge**: Certain sections/departments are responsible for transactions charged.
6. **Checking Cycle**: A time cycle that is recommended to always be done before the closing of the end-month book. This is to see which transactions are still hanging and not completed.

In the Remark column, it can be seen that some of the transaction codes that have been implemented are running individually and without any relationship between one module to another. This will be
different if the uploaded forecast is already executed, then the transaction order and the relationship between modules will be very visible.

3.9. Modeling of SAP R/3 Implementation Integration system

From the results of the study above, it can be acknowledged that in order to use the SAP R/3 system, especially in the forecast upload module, it is necessary to determine the accuracy of the raw material requirements calculation and overall production plan. After forecasting has been calculated with the right method, the new forecasting data is integrated into the SAP R/3 system. Some other steps that should be done such as calculating the MRP and identifying the implementation of SAP PPQM modules with SY Check List in a given cycle and communicating with related sections for modules that have not been executed properly. Thus, a flowchart was built to design the integration model of SAP R/3 Implementation system (Figure 6):  

![Flowchart Diagram]

**Figure 6. Integration model design of SAP R/3 implementation system.**

The Novelty Score is the creation of SY Check List and the flowchart design of SAP R/3 implementation system integration model. On SY Check List, the order of transaction process and its definition is a provision from SAP AG. Meanwhile, the new update is the addition of the Done, Undone, Remark, Department in Charge, and Checking Cycle columns. The flow chart design is created from the research results which effectiveness calculation method has been calculated, proven, verified, and validated. The steps in this flowchart are a sequence of processes that should be used in chemicals companies (who have implemented SAP R/3) before uploading the forecasting to the system to avoid inaccuracies of raw material needs and production plans.

Product forecasting and Material Requirement Planning (MRP) such as safety stock, minimum lot size, lead time are done periodically every 3 months because it will be expired. Because it is imported material then the safety stock, minimum lot size, lead time will affect the automatic calculation of MRP in SAP R/3. The company needs to conduct training of SAP modules to its employees so that the available modules can be optimized for use. SY Check List is used for mapping the most unused modules yet having an outstanding function can greatly help the company's performance.
4. Conclusion

Readiness to use SAP R/3 facility especially the forecast uploading module is simultaneous with the readiness of its logistic information system accuracy. Linear forecasting model is the best method for products in classification A. From the actual demand data, a forecast calculation was made with Linear, Moving Average and Simple Exponential Smoothing model. The smallest Mean Absolute Deviation (MAD) is shown by Linear forecasting and is used to calculate the forecasting in the next 6 periods. The calculation results of the 6 periods is used as a basis of Master Production Schedule (MPS) and with the product structure BOM (Bill of Material), then to calculate the raw material needs as a basis for purchasing.

From the calculation of Material Requirement Planning, the Lot-For-Lot method was chosen. This result is used as a basis to purchase raw materials more accurately because some of the raw materials have to be imported from foreign suppliers like Japan and Europe. The MRP calculation result shows that the company will go through stock deficiency in the fifth and sixth period/month, so that it has to be produced from a month before. The deficient raw materials are PB-X and PB-Y which known as intermediate materials. There are 6 material that is deficient in the fifth and sixth months, which are imported materials. The SY checklist which has been made shows that, all this time the SAP R/3 that never been used optimally, is only because there is a doubt in uploading the forecast received from Sales Department. SY Check List is open for further research development until the SAP R/3 modules increases the company branch performance, in accordance to main company target performance.

References

[1] Yontar E. A Comparative Study to Evaluate of Sap and Logo Erp Software’s for Smes and Big Businesses. Turkish J. Eng. Environ. Sci. 2019 Jan 1;1–10. doi.org/10.31127/tuje.416678
[2] Fui-Hoon Nah F, Lee-Shang Lau J, Kuang J. Critical factors for successful implementation of enterprise systems. Bus. Process Manag. J. Emerald; 2001 Aug;7(3):285–96. doi.org/10.1108/14637150110392782
[3] Amran TG, Azmi N, Surjawati AA. Information system and website design to support the automotive manufacture ERP system. IOP Conference Series: Mater. Sci. Eng. R Rep. IOP Publishing; 2017 Dec;277:012007. doi.org/10.1088/1757-899x/277/1/012007
[4] Okrent MD, Vokurka RJ. Process mapping in successful ERP implementations. Ind. Manag. Data Syst. Emerald; 2004 Oct;104(8):637–43. doi.org/10.1108/02635570410561618
[5] Fadlilah S, Utama AAGS. The Adaptation of Delone and Mclean’s Information System Model to Test The Success of the Erp-Sap Implementation in Middle-Level Management: A Study Case at PT Petrokimia Gresik. 1st International Conference on Islamic Economics, Business, and Philanthropy. SCITEPRESS - Science and Technology Publications; 2017; doi.org/10.5220/0007081102950299
[6] Su Y, Yang C. A structural equation model for analyzing the impact of ERP on SCM. Expert. Syst. Appl. Elsevier BV; 2010 Jan;37(1):456–69. http://dx.doi.org/10.1016/j.eswa.2009.05.061
[7] Millstein MA, Yang L, Li H. Optimizing ABC inventory grouping decisions. Int. J. Prod. Econ. Elsevier BV; 2014 Feb;148:71–80. http://dx.doi.org/10.1016/j.ijpe.2013.11.007