Implementation of Parts Database Search System (PDSS) To Improve Productivity

Rajendra D

Department of Industrial Engineering & Management

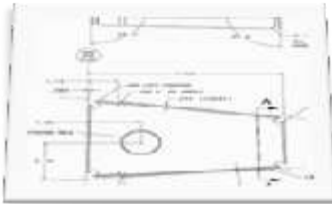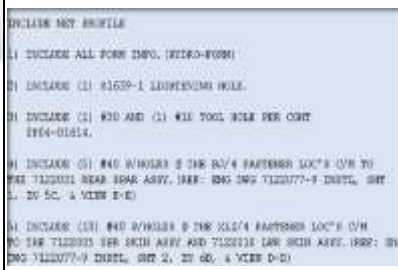JSS Academy of Technical Education

Bangalore, Karnataka

India

Abstract

It is very important for an Organization to meet Customer Requirement and Deliver the Products before Due date. When a Business Project starts, the flow of the project begins from Design Engineering then moves to Manufacturing Engineering and then to Tool Engineering and finally it moves to the Production. Once Design Engineering starts releasing the drawings, Manufacturing starts creating Process Plans (Routing sheets), Bill of Materials and Tool Work Orders and Tooling Engineering will start working on creating tools for the production

Figure 1: The Design – Manufacturing – Tooling – Production Interface.

Design Engineering	Manufacture Engineering	Tooling Engineering	Production
Engineering drawings	Sequence of Manufacturing Operation (Routing sheet) Tool Work Order Instructions (TWO's)	NC Programming Hydro Block Tool	Final Component

The company receives Engineering drawings from the Leading Manufacturers of Aerospace & Automobile sectors. They are the major leading component manufacturing in Sheet metals, Machining components, Tubes etc. Once the drawing is received from the customer, work load will pick up for Manufacturing Engineering Team but in the mean time Tooling & Production line will be waiting for Manufacturing Engineering Team to release the Tool Work Orders & Route card.

Until Tool Work Orders are released Tooling Team will have less work load. In this effort we thought to increase the productivity of the Manufacturing Engineering to release maximum Tool Work Orders & Route card to the Tooling Team & start the production process at the early stage to meet due dates and to satisfy the customer needs.

Key Words: *Due Date, Increases Productivity, Reduce Decision Making Time, Reduce Dependency, Quality, Reduce training efforts.*

_____

## 1. INTRODUCTION TO METHODS DEPARTMENT (PROCESS PLANNING)

For an organization to manufacture a product which should meet the required design specification the manufacturing of each component of the product must be thoroughly planned. Based on a thorough knowledge of machines, tools, methods, staff, materials and product specifications, manufacturing engineering will select and sequence the processes and operations required to transform the chosen raw material into the finished component. It should also meet the required quality. The manufacturing of the product should be cost-effective and also should maximize the added value of the product. Therefore, through process planning the manufacturing engineer is responsible to ensure that the product is manufactured to the correct specification at the lowest possible cost and to complete it on time. This particular task is the focus of this manual and the activities involved in process planning will be discussed.

- Create process plan for sheet metal parts, machining components & small assemblies.
- Create process plan for tubes details & tube assemblies.
- Create Tool Work Orders (TWO's) instructions for Tooling.
- Create Method sheets.
- Create Change Requests (CR) for engineering whenever required.
- Support shop floor employees.

2. WORK FLOW

The Engineering drawing is received from the customer; the manufacturing engineering team starts creating the Material Masters, Routing, BOM Items, create TWO Instructions for tooling. The Tooling folks generate the NC programming & build tools for production to fabrication the component. The inspection checks for the functions involved in product design and manufacture. The components should be visual inspected by the quality inspector and mark with the part number and send to the stores.

Figure –2: Represents the Work Flow of the Manufacturing Team.
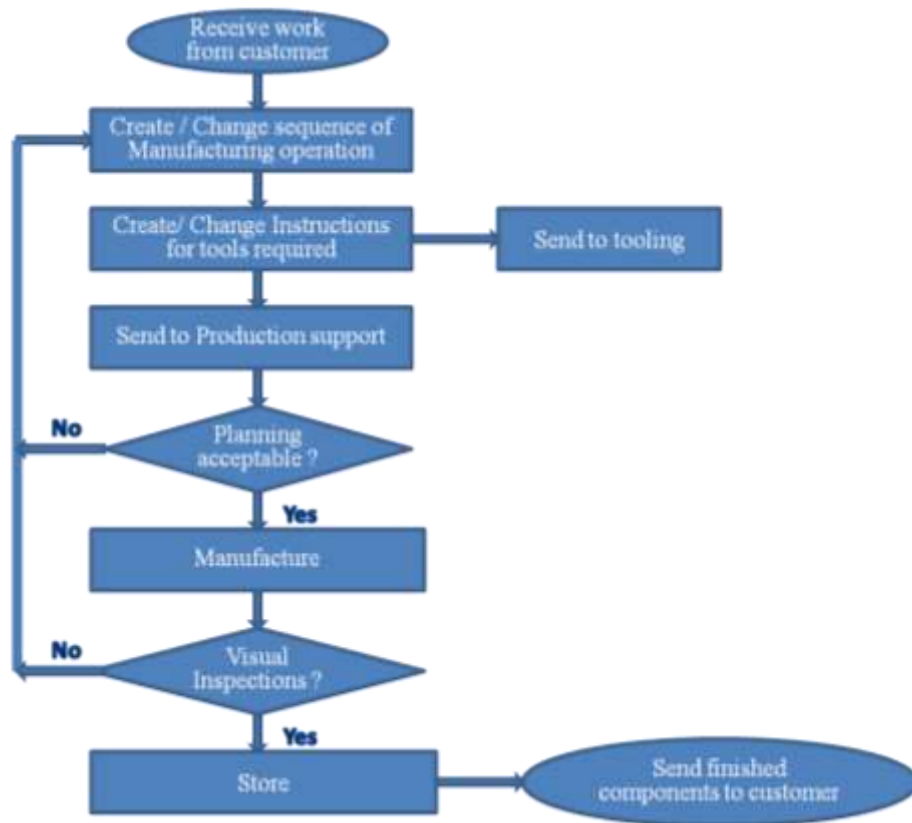
3. SEQUENCE OF PLANNING / ROUTINGS

Figure –3: Represents the sequence of planning (or) routing process
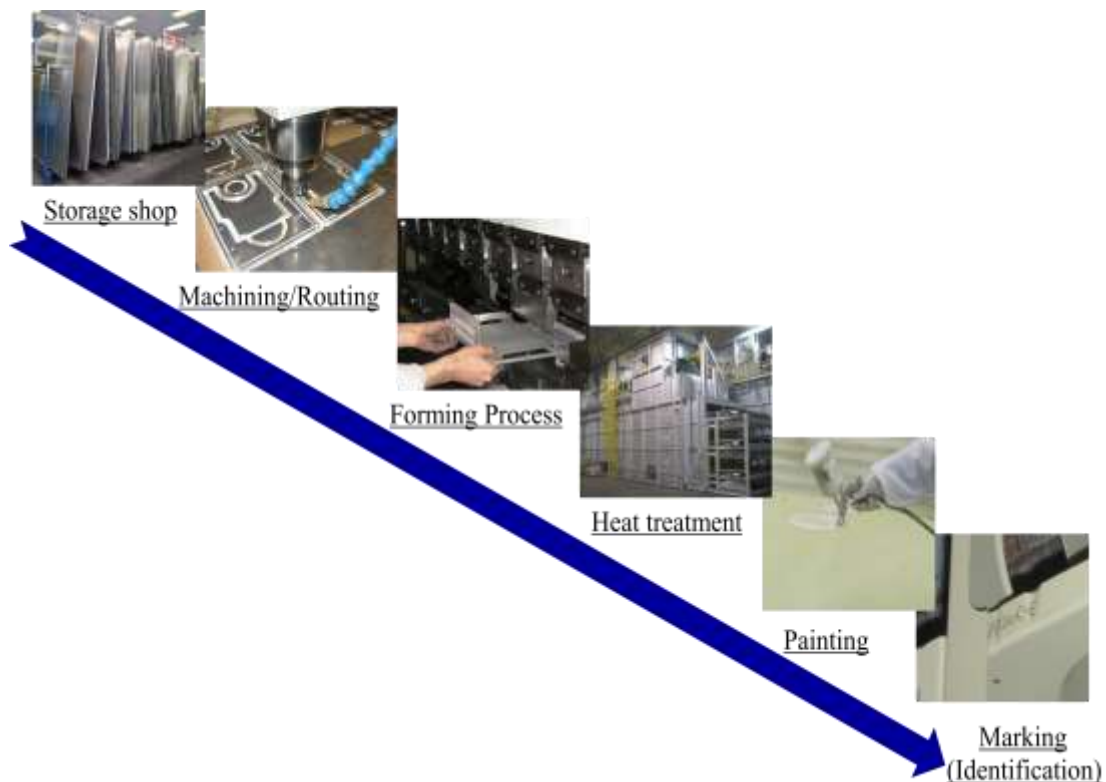
Process planning is a sequence of operations to transform a chosen raw material into finished component. It is the act of preparing detailed work instructions in terms of Routings. This includes the selection of,

- Drawing interpretation

- Raw material

- Manufacturing process and operations

- Machine selection and operations sequencing.

- Production Equipments

- Required Tooling's

- Determining manufacturing parameters (Inspections)

- Documenting in the ERP systems

3.1 RESPONSIBILITIES

- To ensure that the product meets the design specification by best manufacturing process.

- To ensure that it has been manufactured to required quality & most cost effective method.

- To manufacture the product in the most cost effective method.

- To manufacture the product before the deadline.

- Issue Engineering Change Requests (ECR) to improve or eliminate manufacturing issues.

4. CHALLENGES

- Currently Manufacturing Engineering team spends more time for planning activities of sheet metal detail (or) assemblies, machining components, tubes details (or) assemblies. Which leads to the planning delay when project is crucial?

- Manufacturing Engineering team spends more time to discuss on queries within the team & shop floor employees. Engineers are working in a kind of isolation resulting in asking repeated questions to same shop floor employees.

- There is no standard lead time for any of the planning tasks that the manufacturing team works on.

5. OBJECTIVES

- To increase the productivity by standardizing the lead time required for completing the planning task.

- To reduce decision making time on the planning task & meet the due dates.

- To reduce discussion / communication time within the team / shop floor.

- To reduce dependency of an individuals.

6. CASE STUDY

The practical exposure which helps to understand the functioning and working conditions of an organization and also collected data from the shop floor environment.

I have focused into the fabrication of sheet metal details, machining components, tube details & assemblies by understanding the Manufacturing facilities, Machining details, Material specification, Man power, Tools & equipments, Inspection procedure, Quality checks.

Once the drawing is received from the customers; they fallow SOP (Standard Operating Process) by allocating the following steps,

- Required Man Power,

- Availability of Machines, Tool & Equipments,

- Availability of required Material & meeting to the customer specification,

- Measurement action to be taken to first pass yield without rework in the later stages,

- Methods to clarify on Process steps, communication with ME folks,

- Meeting the Due dates is high priority.

Figure –4: The SOP is represented in a Fish Bone Diagram.
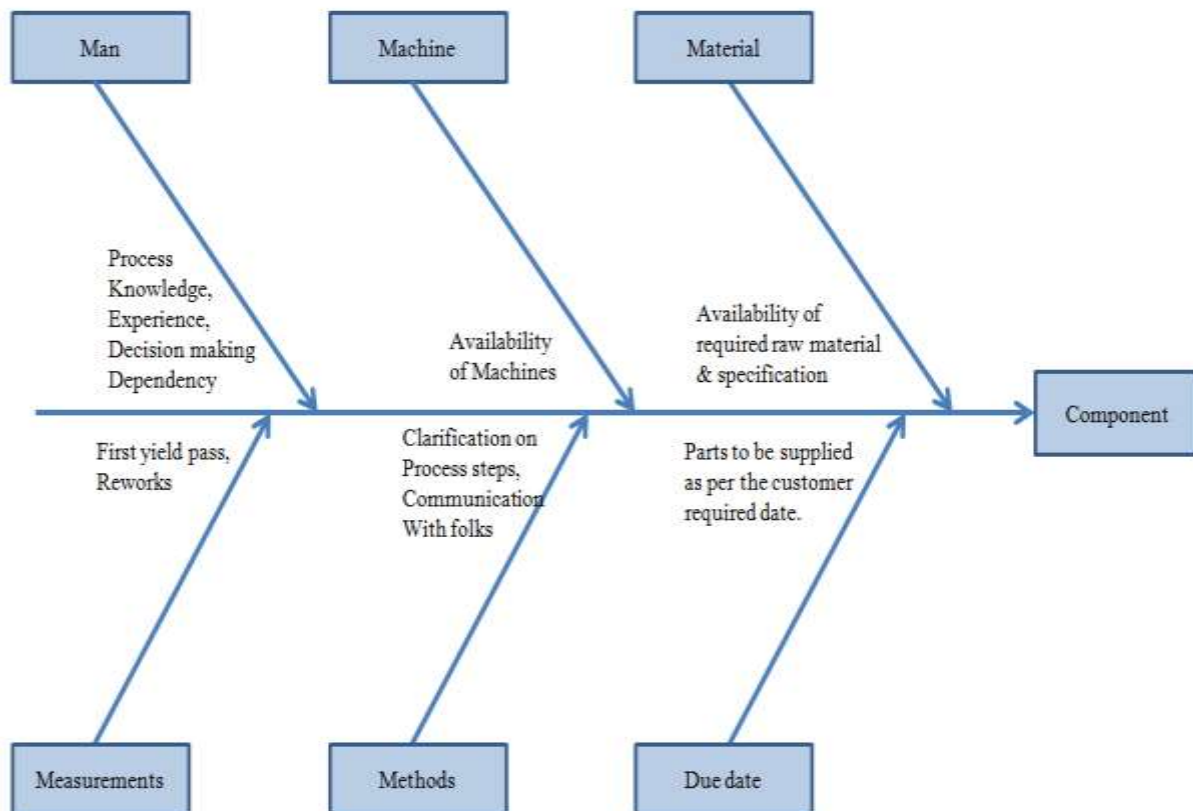
Fish Bone Diagram

Based on the time study, I have recorded that, Manufacturing Engineering team has planned 5350+ parts, including sheet metal details, machining components, tube details & assemblies were planned by ME team last year - 2015.
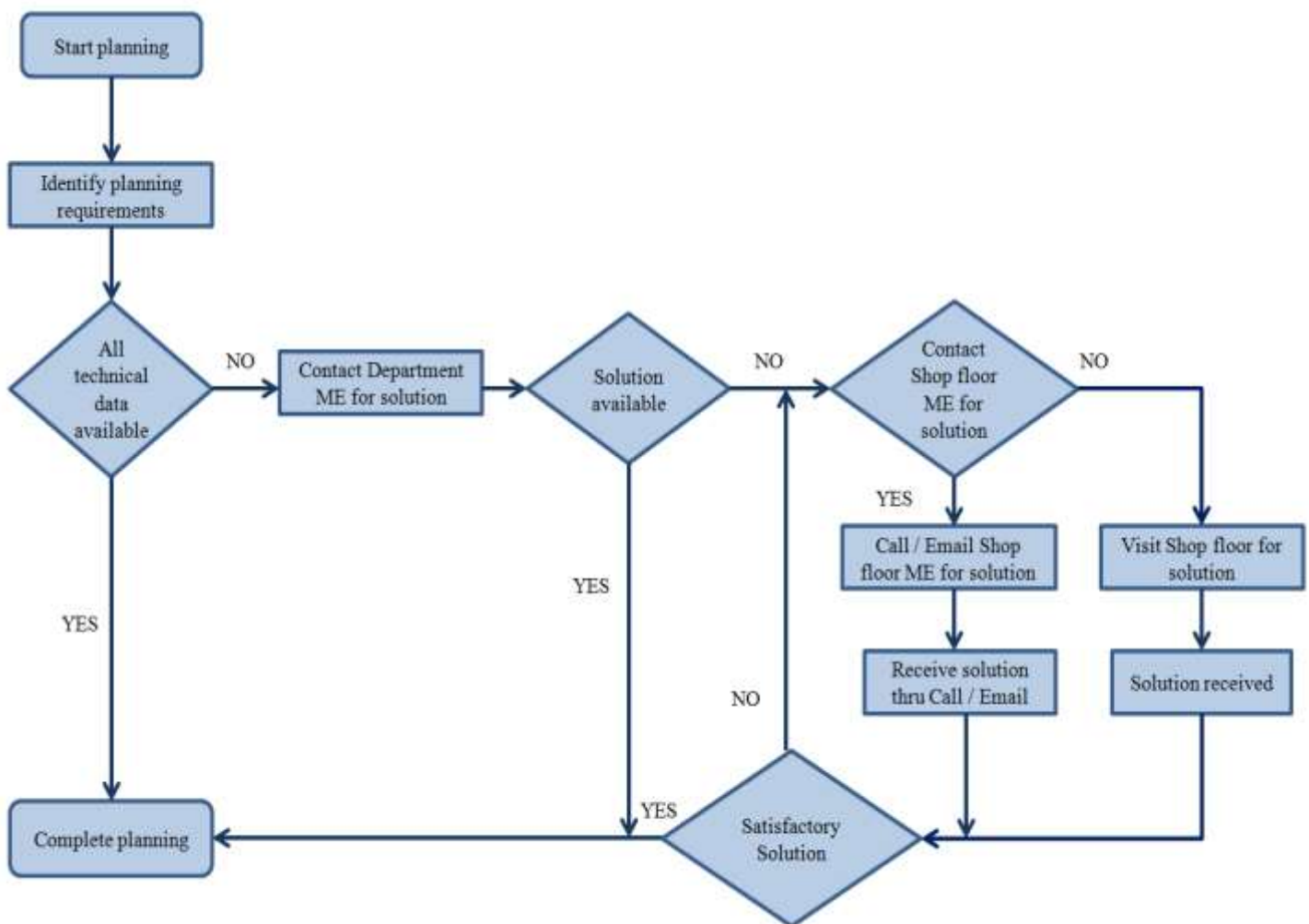
Table1. Details of parts planned in 2015.

Time Calculation

Total Routing produced - 2015	**5350**
Total Work (Hours)	**~ 20000**
Time Required to Create One routing (Hour)	**~ 3.75**

The Manufacturing Engineering Team makes the detail study of Engineering drawing which is received from the customer, and starts the planning task.

Figure –5: The Detail Process Map.

I have analyzed that; the manufacturing team is spending more time in the following factors,

- Decision Time: Due to lack of knowledge on manufacturing process,
- Discussion Time: Time lost in discussion with Department ME's and Shop floor ME is more.
- Repeated Questions: Different Engineers ask repeated questions to the same person in shop floor.
- Travel Time: Visiting the shop floor to receive solution.

Figure –6: Explains the delay of planning activities.
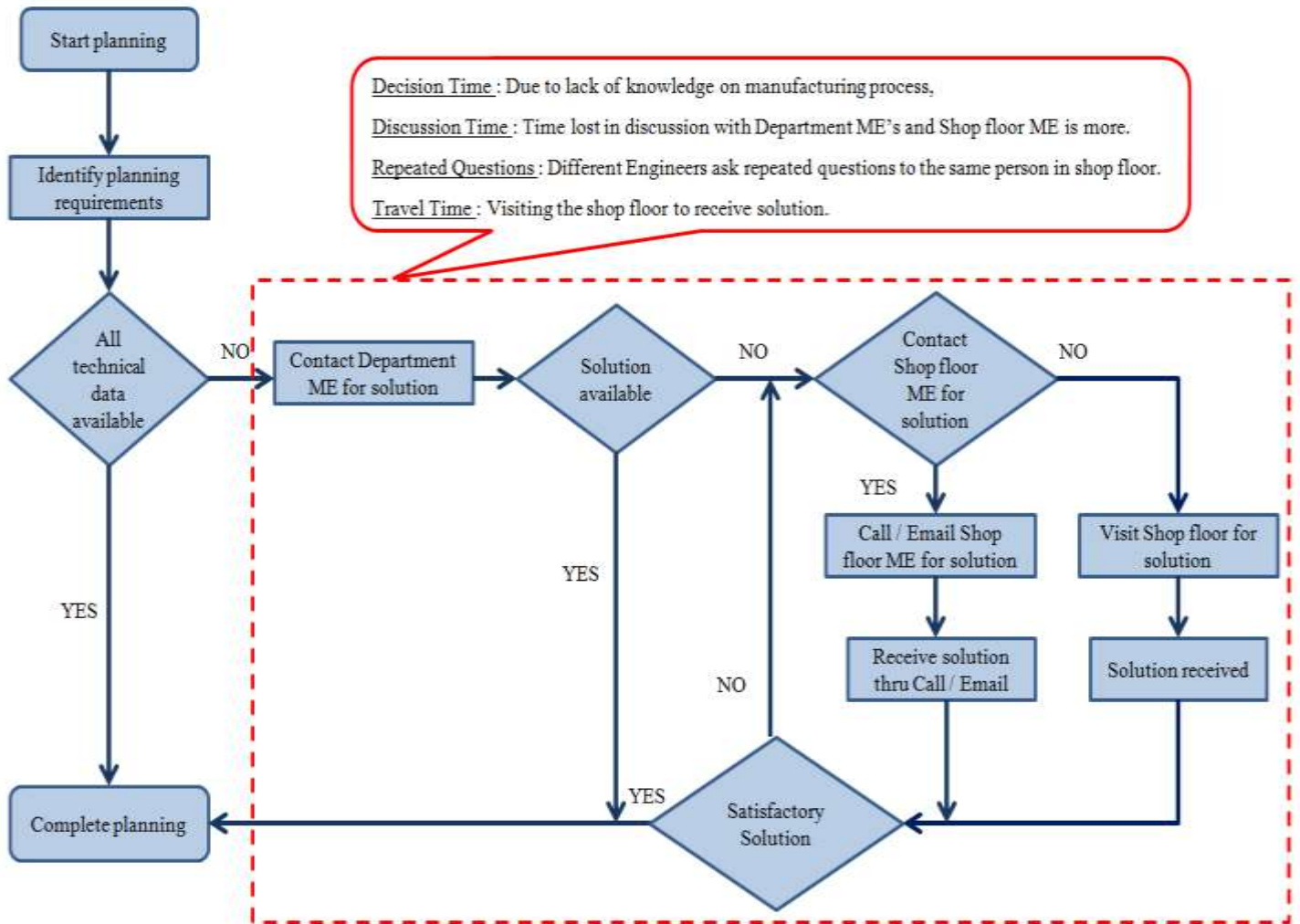
In order to increase the productivity of the planning task, I have decided to implement a database which helps to find the similar parts planned by the manufacturing team in a short lead time.

Hence forth, it will reduce decision making time, discussion and communication time and also it helps an individual to work independently.

Figure –7: Explains the Implementation of Database System.
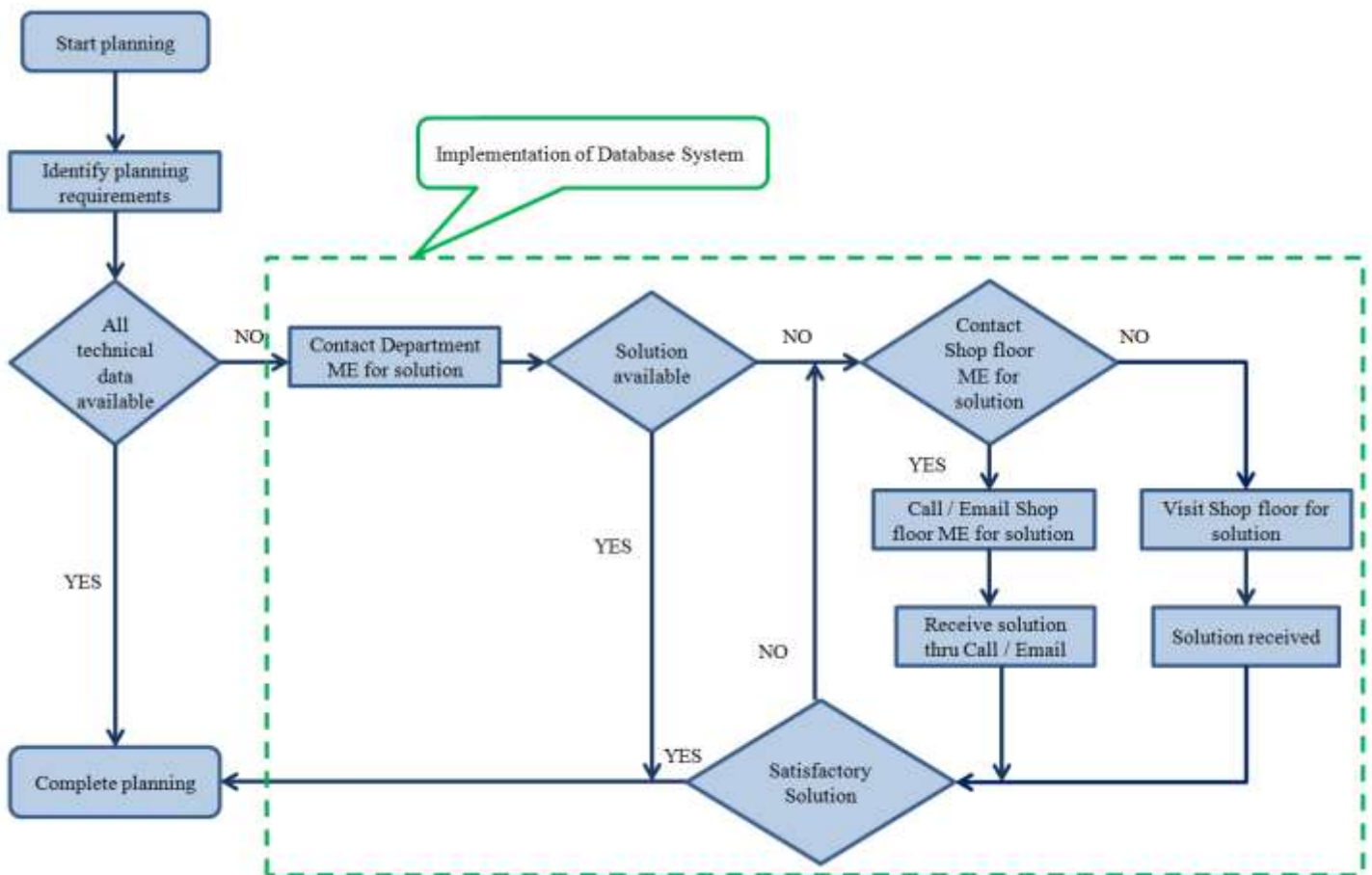
Collection of legacy parts or planned parts, I have made details study of the legacy parts / planned parts by bifurcating into, Form Feature, Form Type, Material Spec & Finish.

Segregated parts as per the Complexity, SOP (Standard Operating Process)

Created a Standard Template in Excel and named as Master File. In this Master File all the planned parts are recorded by the manufacturing engineers for the future reference.

7. METHODOLOGY

Develop and Implement Parts Database Search System Tool [PDSS]

- Created Parts Database Search system (PDSS) using Microsoft Access.
- Microsoft Office Access is a database management system with a graphical user interface and software-development tools to have Jet Database Engine.
- It stores data in its own format based on the Access Jet Database Engine. It can also import or link directly to data stored in other applications and databases.
- The Microsoft® Access Database is made up of 6 major components:
  - Tables;
  - Relationships;
  - Queries;
  - Forms;

- Reports;
- Macros;

Currently in this database project we have made use of Tables, Queries, Forms and VBA to make the project more users friendly and easy to use.

7.1 DATABASE MAIN PAGE
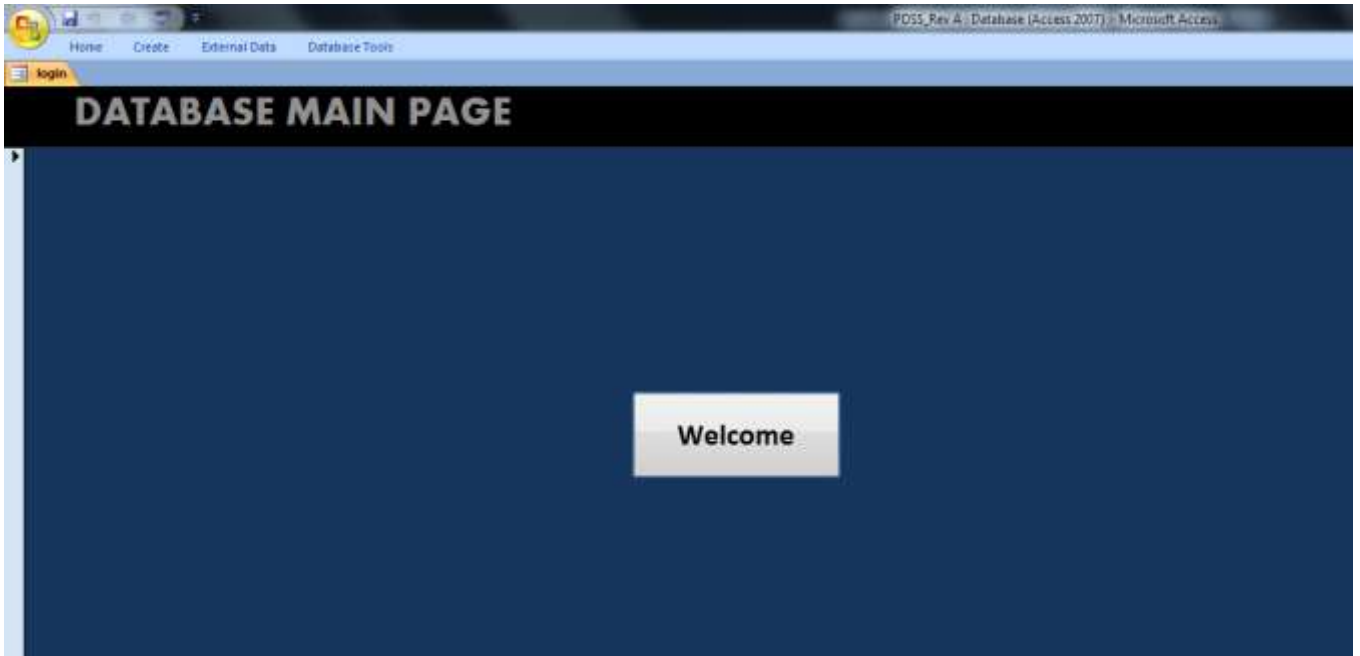
7.2 CATAGORY FORM

USING PART DATA BASE (SEARCH SYSTEM)..

FLAT PART

BRAKE FORM

HYDRO FORM

PRESS FORM

ROLL FORM

INPUT FIELDS:

1. **Form Feature:** Enter the Form Feature in which the part has to be planned.

2. **Part Feature / Part Size / No of Bends:** Based on parts configuration.

3. **Material:** Select the material in which the part is fabricated.

4. **Thickness:** Select from the engineering drawing.

5. **Initial Condition:** Initial condition of the part per engineering drawing.

6. **Final Condition:** Final condition of the part per engineering drawing.

7. **Finish:** Finish of the part per engineering drawing.

UNIVERSAL KEYS:

- **Search:** Will search the Input fields entered in the Text Box.
- **Show All:** To display all the records in Brake Form.
- **Clear:** Will clear the Input field so that we can search for different criteria's.
- **Back:** Will return back to Category Form.

NOTES:

- Refer the ERP appearing along with the search result.
- Always choose the part with **recently planned date** from the search result.

Using Parts Database Search System Tool [PDSS] the manufacturing engineer can search the similar parts in the PDSS with out intraction inside the team and less intraction with the shop floor folks. When ever engineer gets any updates on

manufacturing point of view from the shop floor, then call a team discussion and update the knowledge and also update

PDSS Tool for future reference.
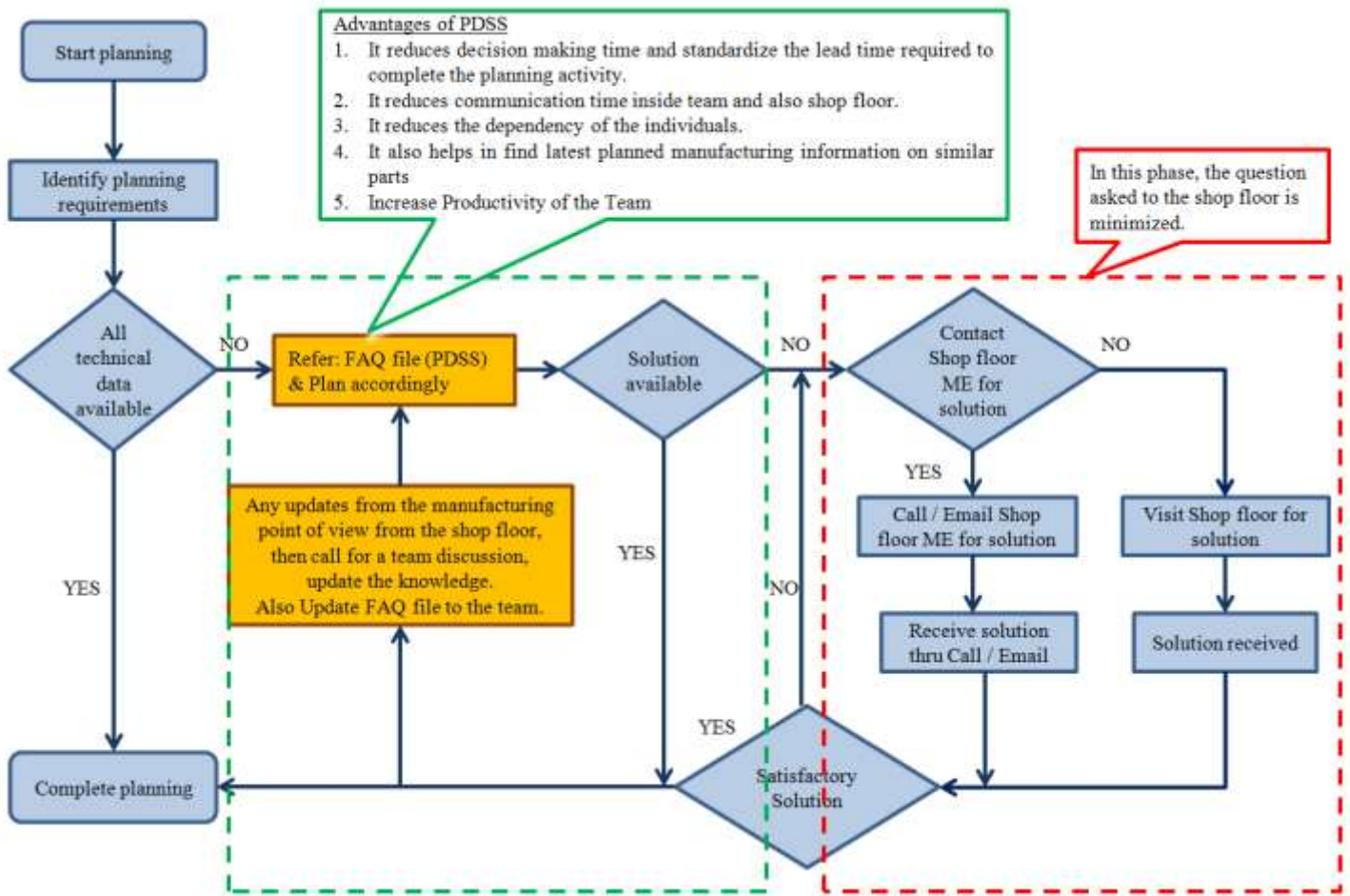
8. RESULT

Table 2. Time Saving Calculation.

Time Saving Calculation	
Total Routing produced - 2015	**5350**
Total Work (Hours)	**~ 20000**
Time Required to create one routing (Hour)	**~ 3.75**
Time taken to create one routing using PDSS (Hour)	**~ 3.00**
Time saved per routing (Minute)	**45**
Time saving for one year (Hours) [2R*45=90]	**225**
Average time saved using PDSS (%)	**20%**

- Time: Reduces 45 minutes per planning, 225 hours in a year/person.

- Cycle time: Reduces by 20%

- Quality: Increases from ~93.5 % to 96.5 %.

- Cost saving: Rs 33,750 / year / person (150/Hr)

- Increases Productivity of the Team

- It reduces decision making time and standardizes the lead time required to complete the planning activity.

- It reduces communication time inside team and also shop floor.

- Team Maturity improvement (independent)

- Minimal planning Delay for upcoming projects

- Improved customer confidence

- Will act as training material for new hires in the team.

- Reduces training effort

9. REFERENCE

1. Business Process & Procedures (BPP) documents – HAT organization.

2. Process & Equipment Guidelines (PEG) documents – HAT organization.

3. Manufacturing Technology for Structural Materials by F.C. Campbell.

4. Process Planning: The design/manufacture interface by Peter Scallan.

5. Design, performance evaluation and optimization of a Sheet Metal process - Spyridon G. Kontogiannis John A. Ekaterina is.

6. Principles and Methods of Sheet Metal Fabrication by George Sachs.