Digital Factory
Data Driven Manufacturing

Case Study

A global two-wheeler manufacturer

Project background

About Client

The client is one of the largest two-wheeler manufacturers in the world, as well as in India. It is currently present in 48 countries with tech centers in India and Germany, and manufacturing facilities in India, Colombia, and Bangladesh. With innovation at the core of its philosophy, it focuses on designing and developing technologically advance two wheelers for customer around the world.

About Project

Re-design of factory monitoring platform that enables manufacturing units and shop floors to connect with each other through data driven insights.

Current Challenges & Pain-points

Production Management

- Reactive approach to monitor shift wise production and losses

- Manual compilation of MIS through Excel leading to higher response time and production losses

- Shift wise manual recording of losses in logbooks and MIS compilation lading to inaccurate data

Maintenance Management

- Decentralised and manual equipment monitoring leading to high SLA

- Manual analysis of breakdown and periodic maintenance causing data errors

Quality Management

- Manual monitoring of quality parameters through gauges leading to high number of rejection and rework due to inaccurate data

- Non availability to track the past data

Tool Management

- Manual tool management approach causing high changeover losses on line

- Reactive method, excel based tool life analysis and high changeover losses on line

Business Goals

Disrupt the legacy system and traditional way of working in the plant by digitising the plant operations

- Optimise operating cost

- Enhanced operational efficiencies

- Boost efficiency and productivity

- Quality enhancement

- Reduce maintenance time

- Zero defect production

Product Challenges

- Inconsistent navigation pattern throughout production, maintenance, tools and quality modules

- The current navigation does not provide option to switch between different modules from any screen

- Negative and positive spacing not balanced

- Layout is very cramped up. No hierarchy in the visual and text.

- Critical information is less readable and given less prominence.

- Information is not categorised for the optimal use

- Poorly structures information and inconsistent layout across the product

- No prioritisation the information making it difficult for the users to take timely decision

- Inefficient use of colours across different screens

- Inconsistent visualisation pattern across various modules

Product Goals

- Ensure availability of real time information from equipment through sensors in digital form at a central place for advance analytics

- To keep the necessary stakeholders informed incase of criticalities through real time notifications

- Enable users to take proactive decisions

- Give operational visibility to all users

- Allow users to monitor real time production

- Accelerate factory operations

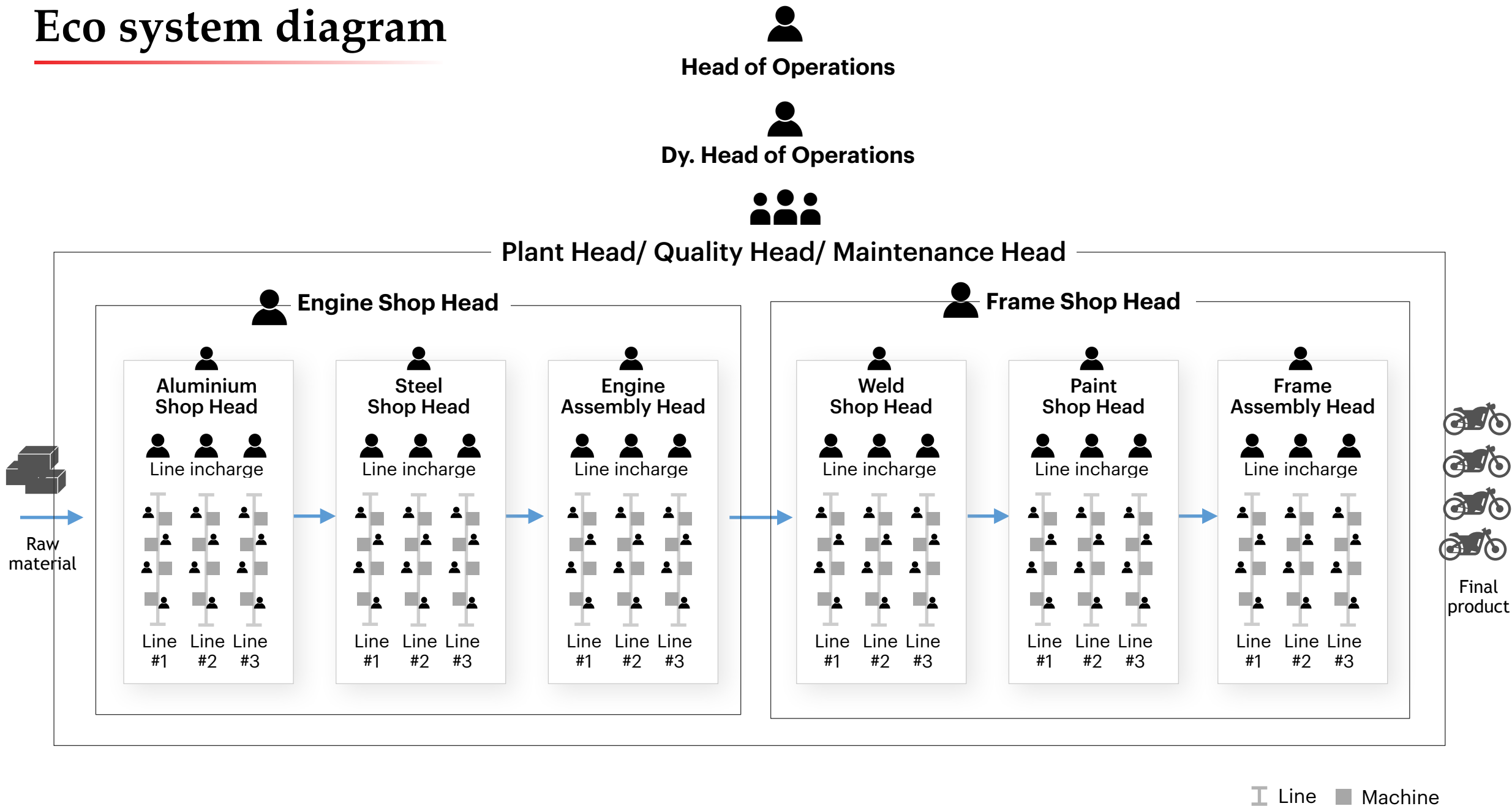- Digitally connect all shops to each other

Design Goals

- **Discovery :** Navigation within the platform to be easier. The user doesn't have to navigate to the main page again and agin, for a smooth non-stop experience.

- **Consolidated :** Enabling the users to view summary of all important parameters upfront to save time.

- **Unifying :** Notifying the right set of users about parameters that might become critical for faster repair times and less breakdowns.

- **Solution Driven :** Allowing the users to drill down to the root cause of the problem in the platform itself.

- **Customisable :** Allowing the Users to choose the KPIs they wish to view.

Eco system diagram

Head of Operations

Dy. Head of Operations

Plant Head/ Quality Head/ Maintenance Head

Engine Shop Head

Frame Shop Head

Aluminium Shop Head	Steel Shop Head	Engine Assembly Head	Weld Shop Head	Paint Shop Head	Frame Assembly Head
Line incharge	Line incharge	Line incharge	Line incharge	Line incharge	Line incharge
Line #1 Line #2 Line #3	Line #1 Line #2 Line #3	Line #1 Line #2 Line #3	Line #1 Line #2 Line #3	Line #1 Line #2 Line #3	Line #1 Line #2 Line #3

Raw material

Final product

Line   Machine

User Insights

- Cohesive experience across all shop floors

- Value driven cost optimisation opportunities

- Seamless and consistent experience across various digital touch points

- Efficient and transparent system

- Technology driven intelligent and smart system

- Proactive engagement throughout the day

- Intelligent handshake between physical and digital environment

- Ensuring the availability of time sensitive information
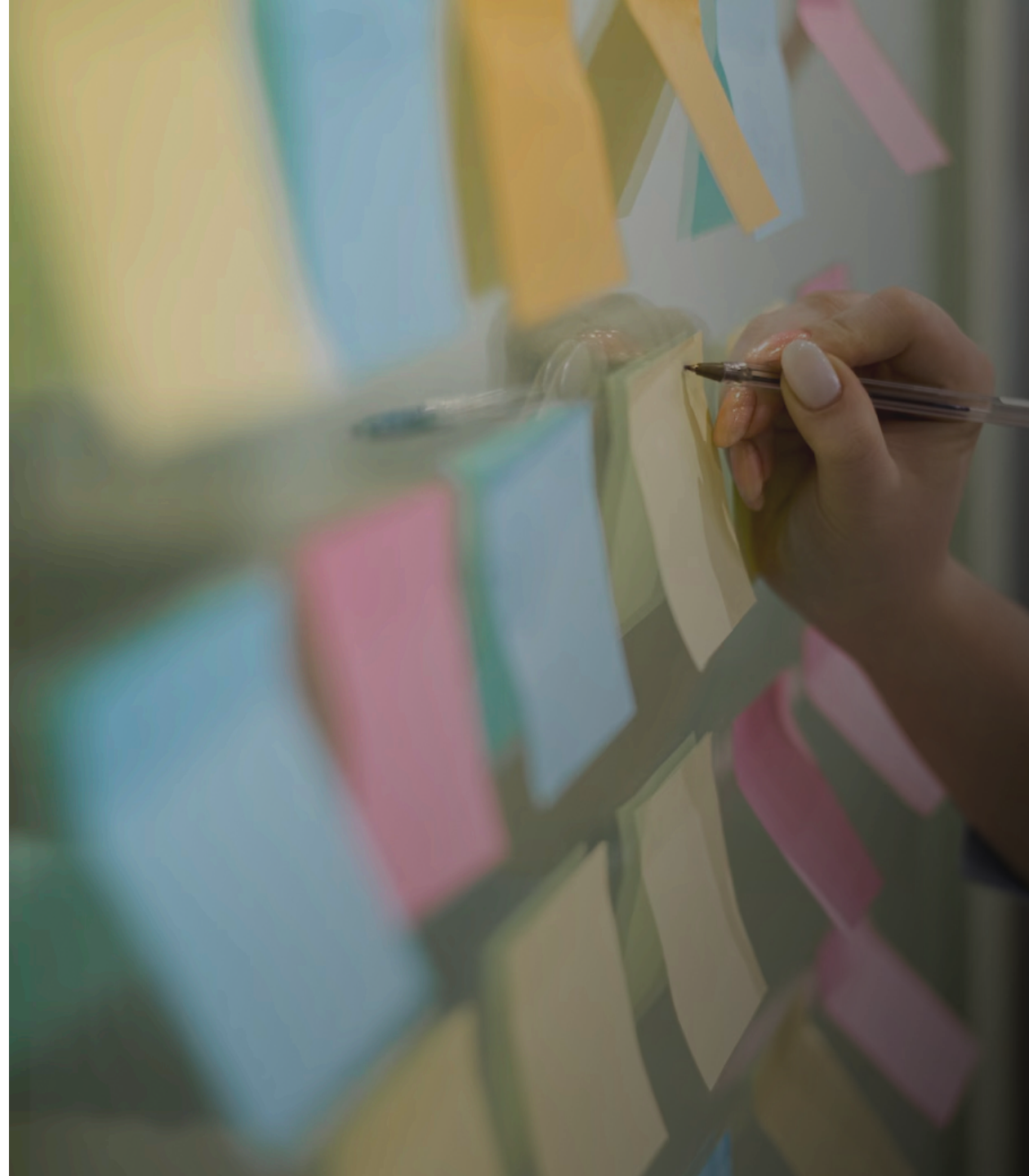
Arvind Joshi - 45 yrs

Plant Head

Has been working in the automobile industry for the last 33 years. He is responsible to monitor and optimise the manufacturing, manpower, and energy cost. He has to ensure safe and secure work environment for shop floor team.

Needs and Expectations

- He wishes to have one connected system to monitor plant operations
- He wishes to see real time production
- Needs to have a reliable system and processes
- Needs to see total productive production in end of the day

Pain Points

- High inventory at plant is a bigger problem
- High maintenance cost because of loss of time due to machine failure

Motivations

- Find innovative methods to optimise inventory
- Zero defect production days
- Productive work environment

Priyadarshan K - 29 yrs
Line Manager

Has been working with the company from past 13 years. He wants to make sure that his daily production target is met and there are minimal downtime throughout the production cycle.

Needs and Expectations

- Needs to have real time information of shift wise production data
- Needs to see previous shift data to bridge the production gap
- He wishes to see safety and fire alarm information along with reason
- He wishes to see manpower information to take proactive decision to align resources
- He wishes to customised and auto generate daily, weekly and monthly reports

Pain Points

- Manual effort to prepare data to execute and monitor operations
- Lack of visibility to other shop data
- No visibility to worker's availability in advance
- Keep manual track of machine maintenance day
- No visibility to safety and fire alarm data at once place

Motivations

- People safety
- Machine status
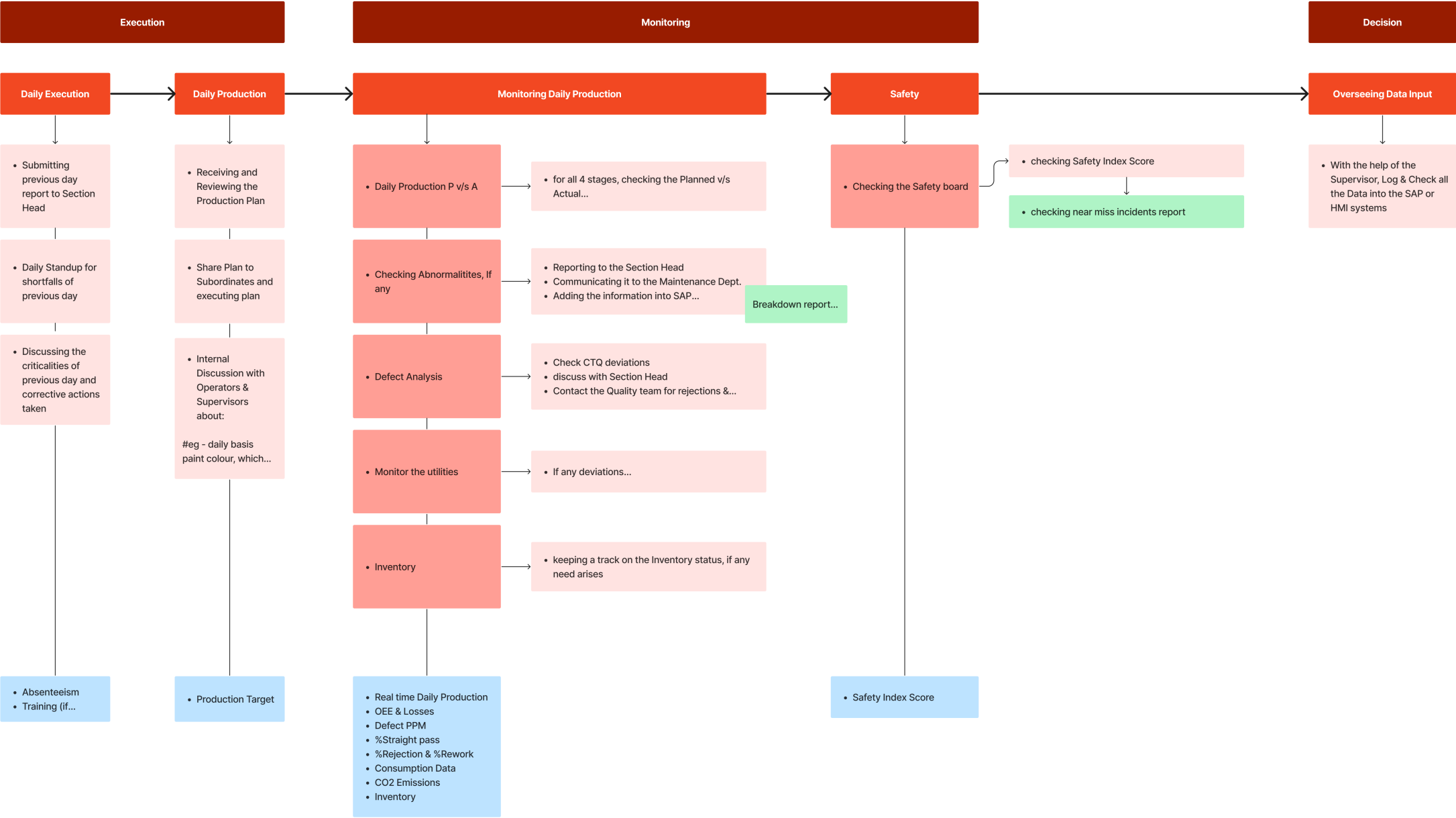- Overall production from his line(s)

User Tasks

Plant Head

- Daily production planning and monitoring

- Monitoring & Achieving team's Business, Behavioural and Developmental targets and keeping motivation & team spirit high

- Ensure smooth synchronisation across all shop floors for smooth functioning of daily production

- Ensure required raw material ans manpower for daily production target

- Monitoring Rejections & Rework everyday

- Reporting production status to top management on daily basis

- Checks OEE for equipment wellness.

- Optimise production and maintenance cost

- Create strategies to optimise inventory

- Keep track of goal sheet and balance score card

- Create strategies for low rate productions

- Take corrective measure to improve the quality

- Do gap analysis to improve the processes
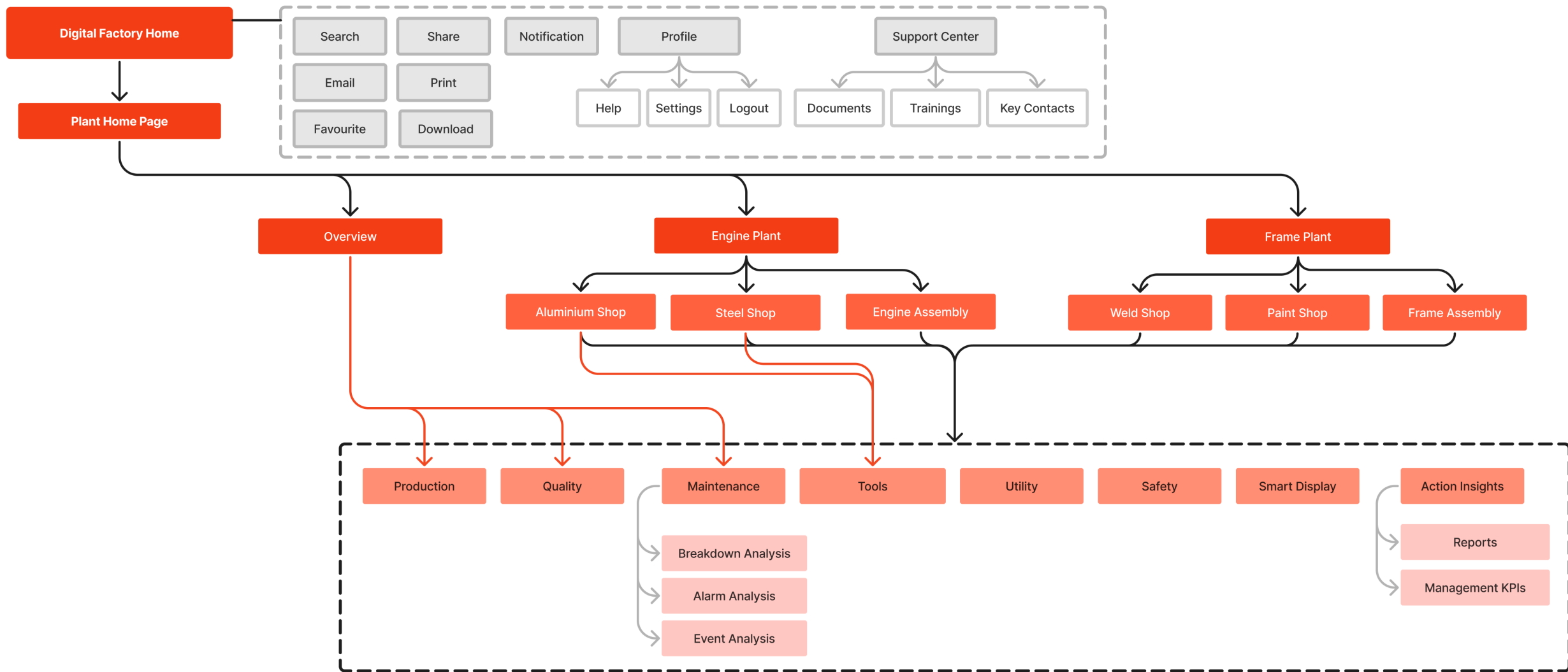
Line Incharge

- Adhere to the daily plan to achieve daily production target

- Check shift-wise manpower information daily to plan and complete the daily target

- Keep track of cost of consumables

- Keep track of rejection cost

- Monitor manpower availability

- Compare shift-wise production data to identify the gap in target

- Monitor and analyse previous shift data to plan for the next shift

- Prepare daily, weekly and monthly reports for management review

- Compare monthly data to better planning

- Check information about maintenance day to ensure low impact on production

- Keep track of total number of machine in each line and shop floor

- Keep track of safety and fire alarm reasons

- Check previous shift breakdown information daily to ensure people safety and machine availability
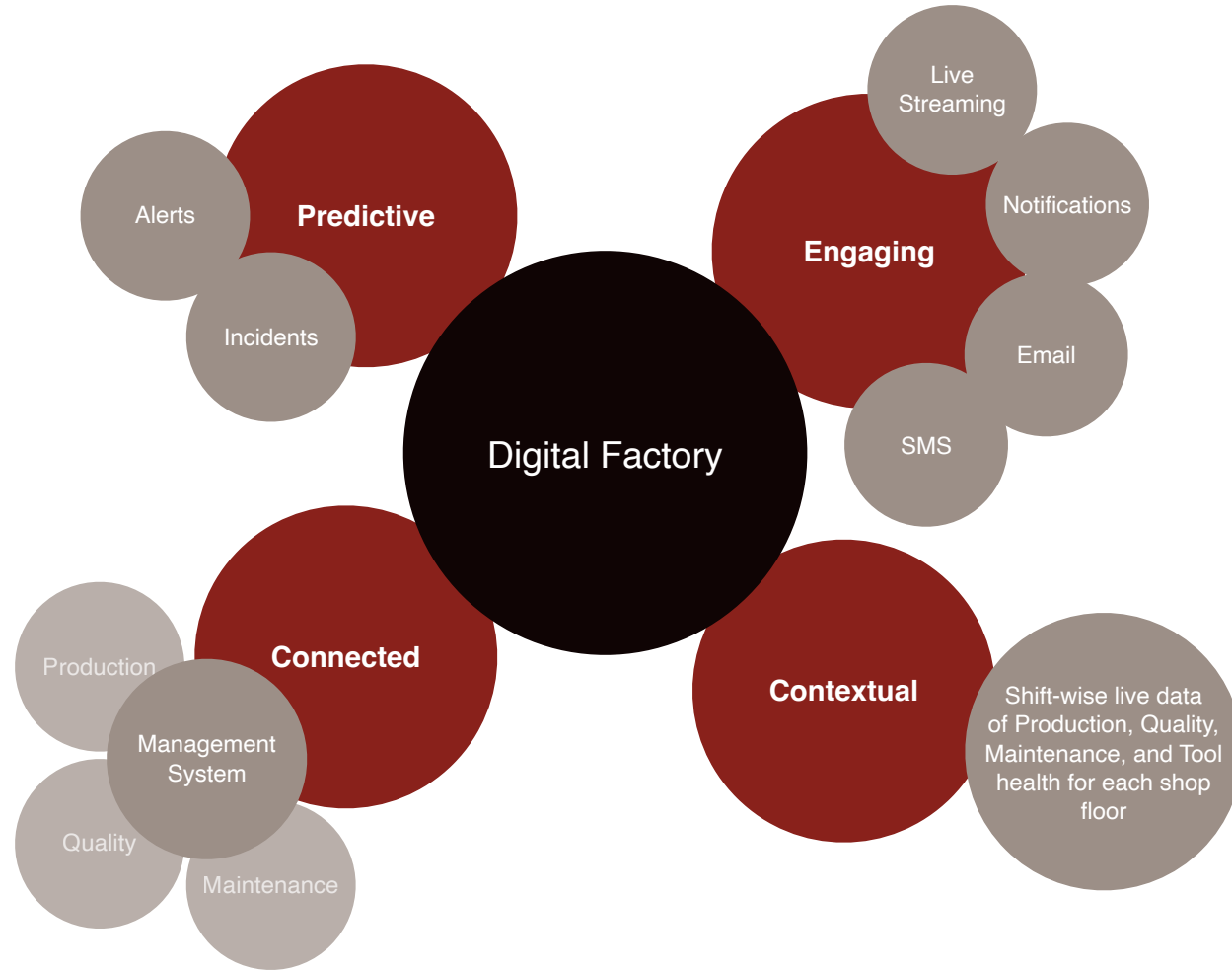
User Journey

User
Line Incharge

TASKS
People Safety | Machine Status | Overall Production

Index | Task | Action | KPI | report

Execution	Monitoring	Decision

Daily Execution → **Daily Production** → **Monitoring Daily Production** → **Safety** → **Overseeing Data Input**

Daily Execution
- Submitting previous day report to Section Head
- Daily Standup for shortfalls of previous day
- Discussing the criticalities of previous day and corrective actions taken

- Absenteeism
- Training (if...

Daily Production
- Receiving and Reviewing the Production Plan
- Share Plan to Subordinates and executing plan
- Internal Discussion with Operators & Supervisors about:

  #eg - daily basis paint colour, which...

- Production Target

Monitoring Daily Production

- Daily Production P v/s A → for all 4 stages, checking the Planned v/s Actual...

- Checking Abnormalitites, If any
  → Reporting to the Section Head
  → Communicating it to the Maintenance Dept.
  → Adding the information into SAP...
  → Breakdown report...

- Defect Analysis
  → Check CTQ deviations
  → discuss with Section Head
  → Contact the Quality team for rejections &...

- Monitor the utilities → If any deviations...

- Inventory → keeping a track on the Inventory status, if any need arises

- Real time Daily Production
- OEE & Losses
- Defect PPM
- %Straight pass
- %Rejection & %Rework
- Consumption Data
- CO2 Emissions
- Inventory

Safety
- Checking the Safety board
  → checking Safety Index Score
  → checking near miss incidents report

- Safety Index Score

Overseeing Data Input
- With the help of the Supervisor, Log & Check all the Data into the SAP or HMI systems

Information Architecture

Digital Factory Home

Plant Home Page

Toolbar panel:
Search | Share | Notification | Profile | Support Center
Email | Print
Favourite | Download

Profile:
Help | Settings | Logout

Support Center:
Documents | Trainings | Key Contacts

Overview | Engine Plant | Frame Plant

Engine Plant:
Aluminium Shop | Steel Shop | Engine Assembly

Frame Plant:
Weld Shop | Paint Shop | Frame Assembly

Production | Quality | Maintenance | Tools | Utility | Safety | Smart Display | Action Insights

Maintenance:
Breakdown Analysis
Alarm Analysis
Event Analysis

Action Insights:
Reports
Management KPIs
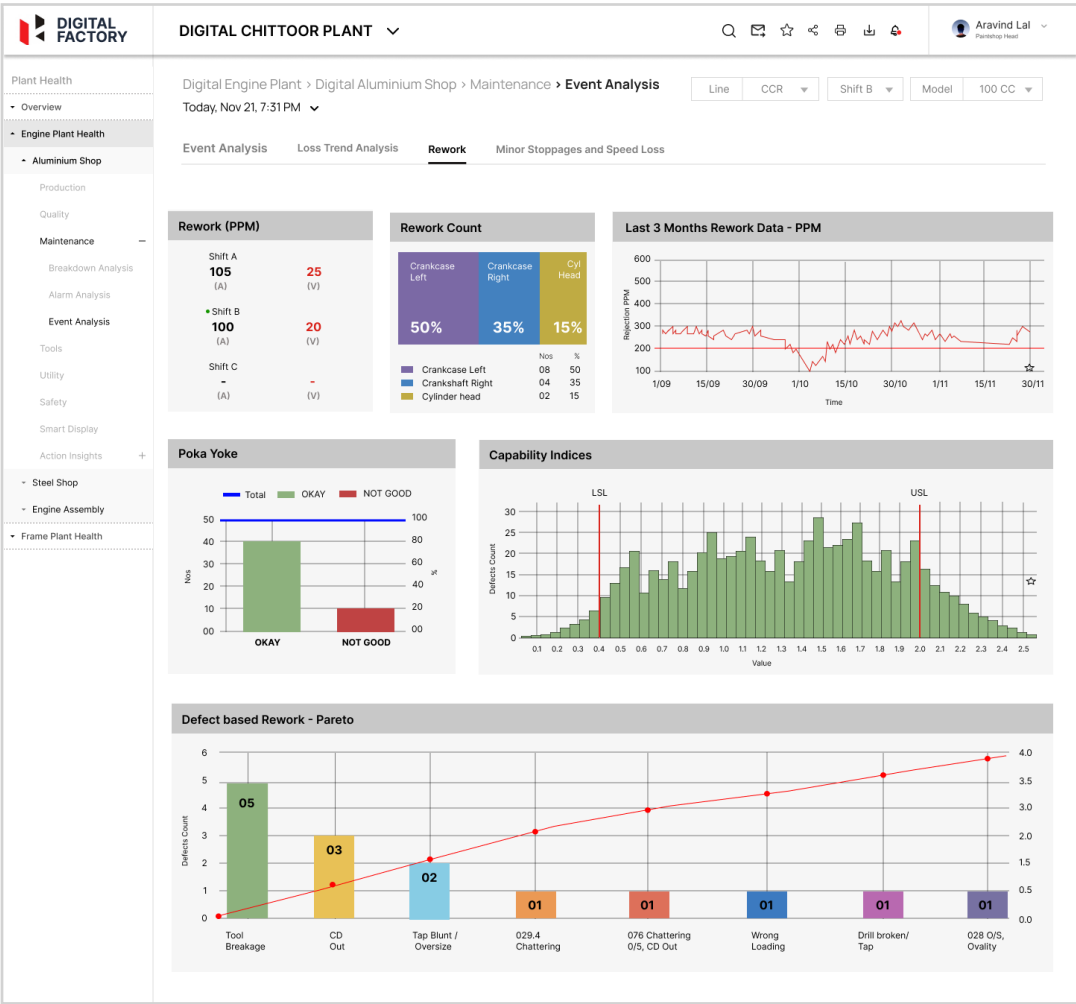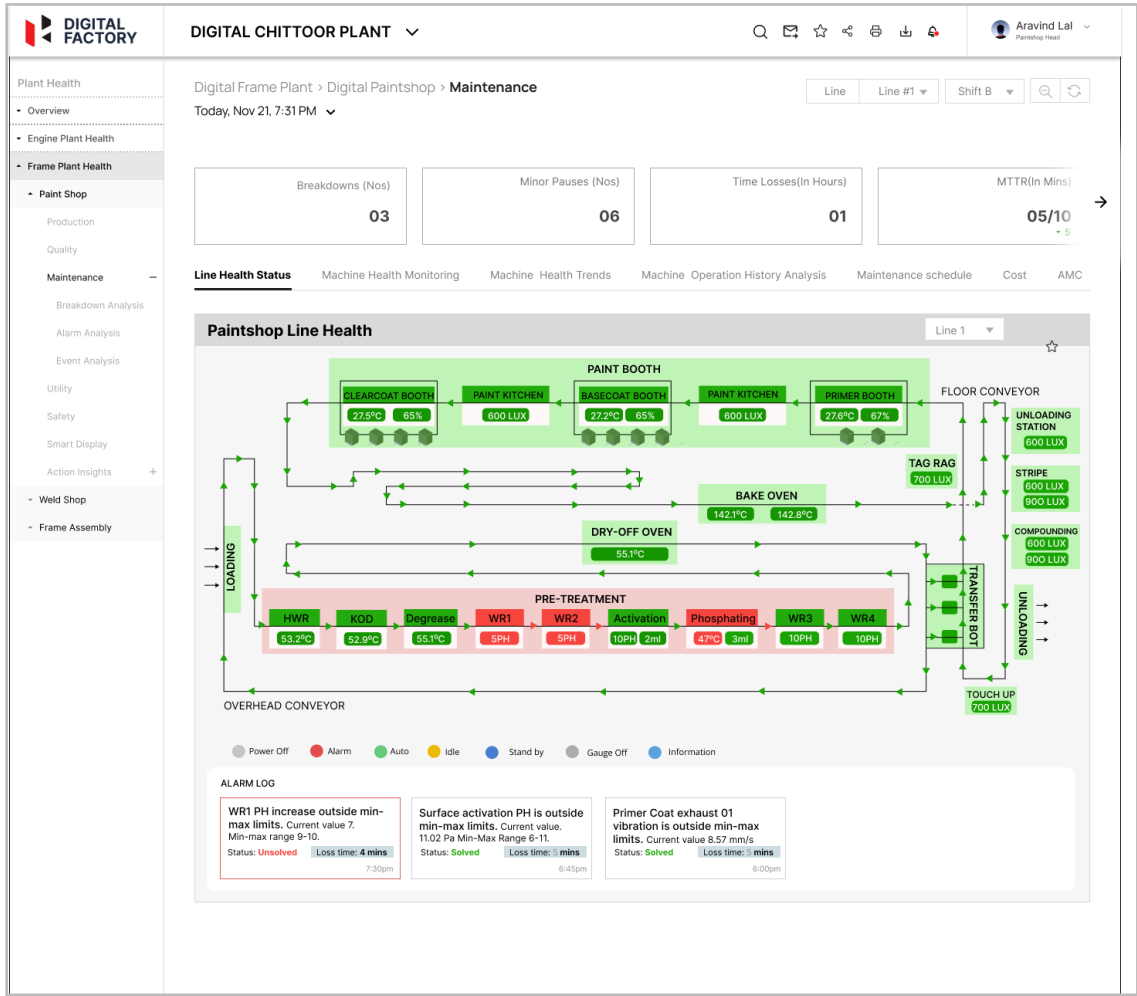
Concept Model

Wireframes

Wireframes: Home page, Smart Display
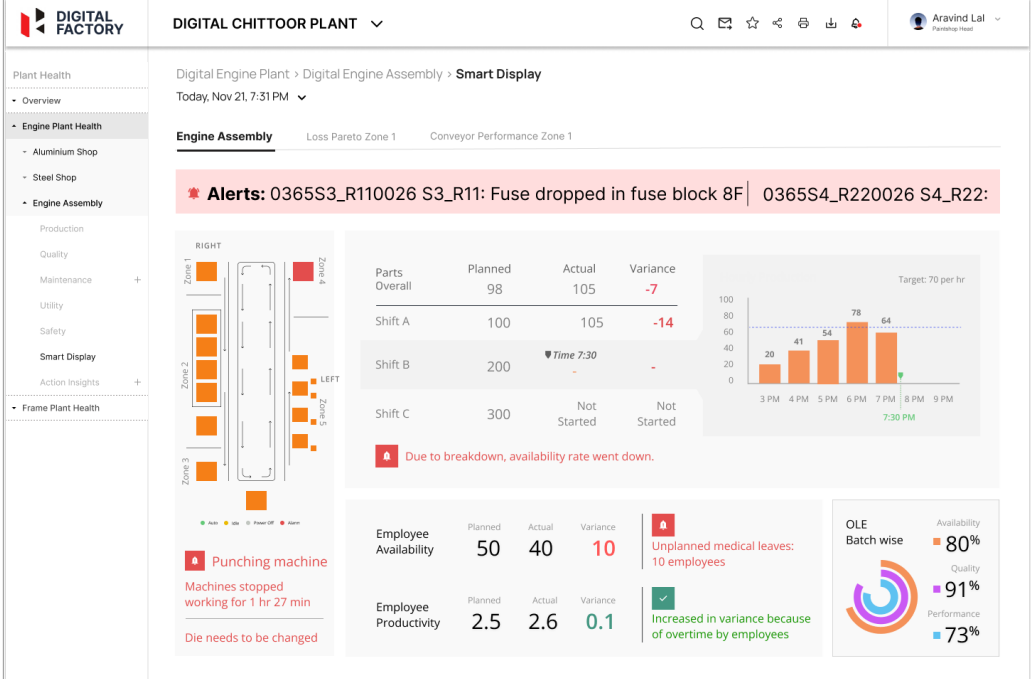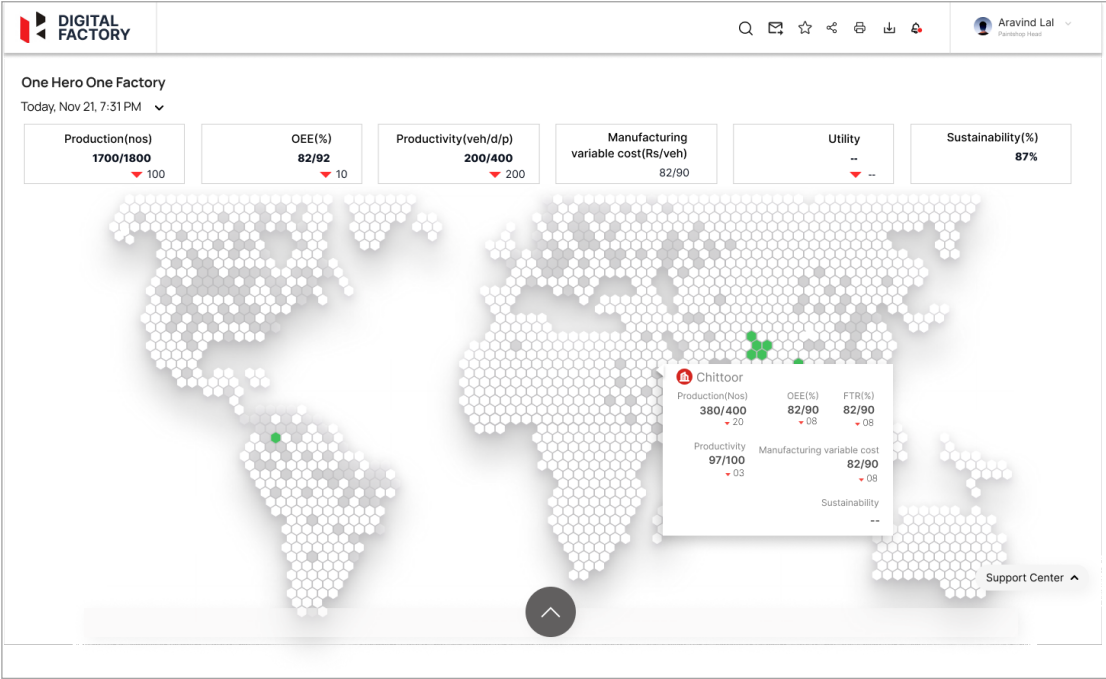
A single display of operational status and performance for each of the geographically distributed manufacturing facilities.
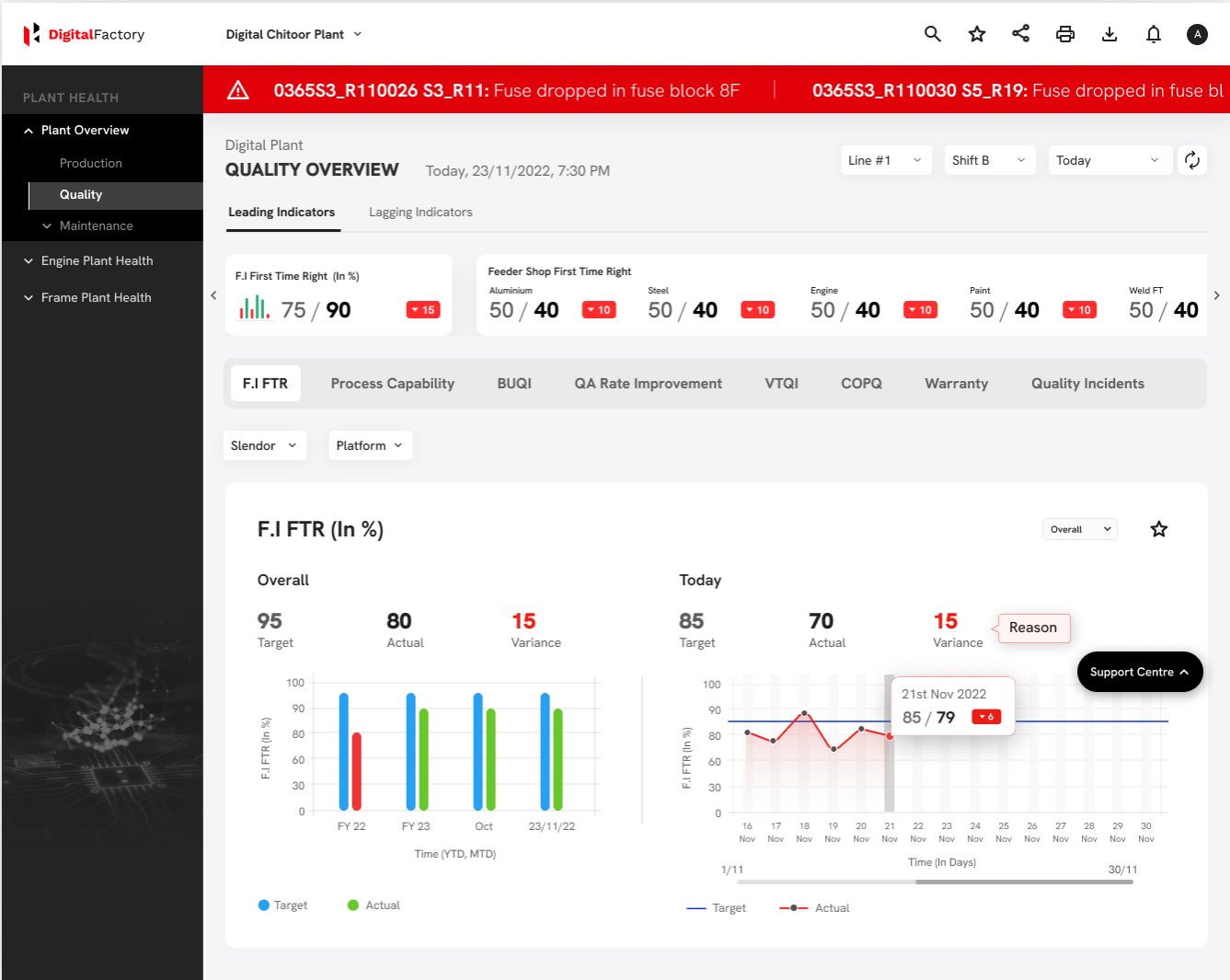
Wireframes: Maintenance

Visual Designs

Final UI - Paint Shop
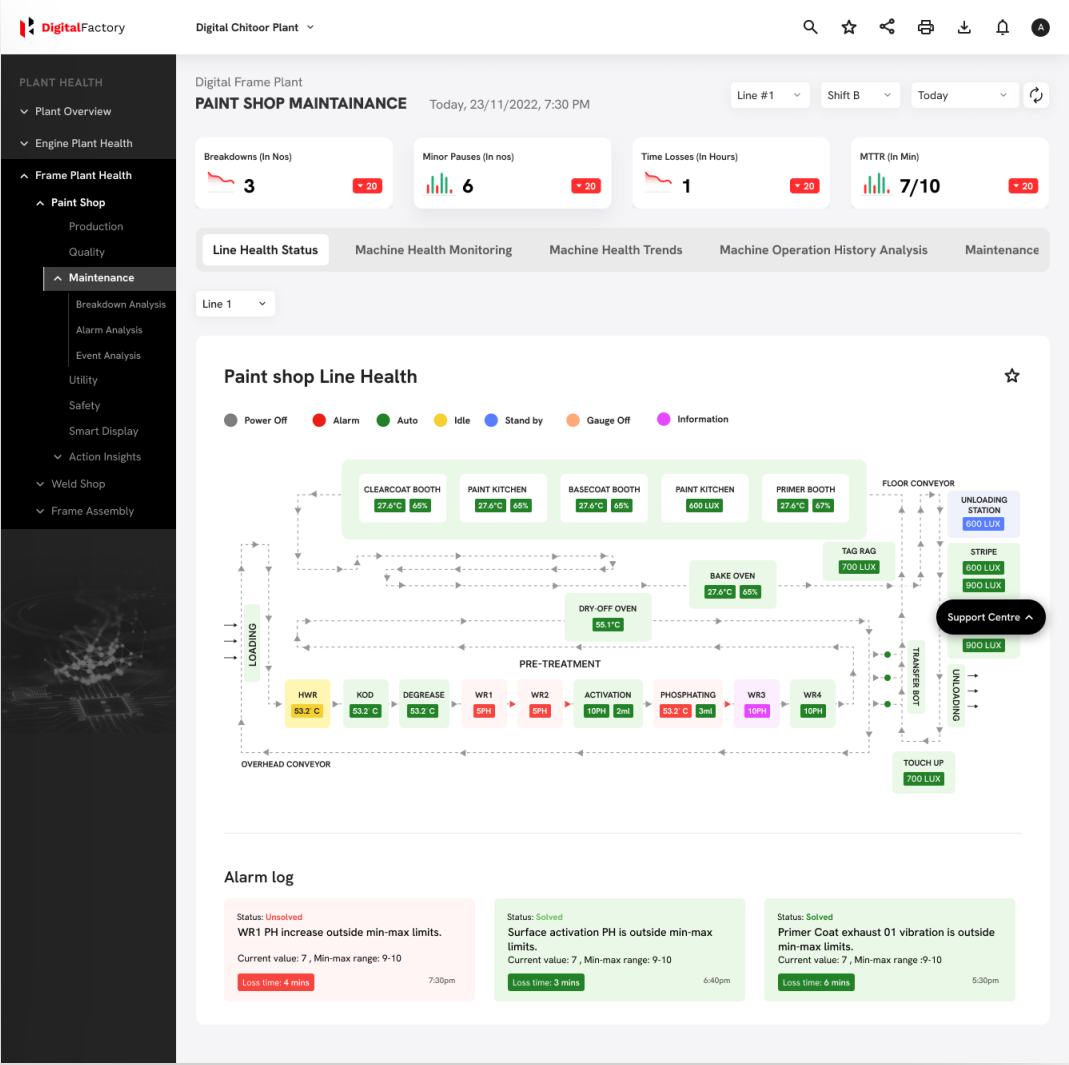
Final UI - Paint Shop

Final UI - Smart Display

Nov 20, 7:31 PM

Machines stopped working for 1 hr 27 min
20 Nov, 1:30 PM

Parts	Planned	Actual	Variance
Overall	600	200	-400
Shift A	100	86	-14
Shift B	200	*Time 7:30* 114	-86
Shift C	300	Not Started	Not Started

Due to breakdown, availability rate went down.

WR-1/WR-2
Machines stopped working for 1 hr 27 min

Incoming hot water temprature low on line#3

	Planned	Actual	Variance	
Employee Availability	50	40	10	Unplann 10 empl
Employee Productivity	2.5	2.6	0.1	Increase of overt

Hourly Production
Target: 70 per hr

100
80
60
40

20   41   54   78   64

Quality   2/4

Nov 20, 7:31 PM

Rejection (ppm)

Shift B *(Current)*	Planned 280	Actual 260	Variance 20
Parts	Planned	Actual	Variance
Lid	85	70	15
Fuel Tank	100	105	5
Frame Body	100	105	5
Shift A	Planned 600	Actual 602	Variance 2

Parts recovered from Rework had some abnormalities regarding Blackness & Paint Chip-off

In Process	Pending	Total Quality Check	Manpower
18	9	299	1,163

Straight Pass (%)

Shift B *(Current)*	Planned 280	Actual 260	Variance 20

100
80
60
40
20
0

20   41   54   78   64

Target: 70 per hr

3 PM   4 PM   5 PM   6 PM   7 PM   8 PM   9 PM

7:30 PM

Shift A	Planned 600	Actual 602	Variance 2

Delay in pre treatment process due to machine pause

Nov 20, 7:31 PM

Machine Health
Overall Health: Good

OP20
Pre-treatment
Status: Not Good

WR 1

| 85°C | 89% |

Phosphating

| 145°C | 75% |

Degreasing

| 85°C | 89% |

Design Outcome

Increased user engagement

Users felt engaged and informed after getting critical actionable data

System Usability Score

Users were easily able to find information easily and quickly

Improved ease of use

Users were able to use the system easily and efficiently to monitor daily operational needs

Consistent interface

Users were able to complete tasks with minimal effort and time

Thank you!