DP-2

8 WEEK PROJECT

Tarasafe International Ltd.

Design Audit Report

Presented To

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Presented By

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Content

Primary Research

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Bhoomika | Dikshita | Shweta | Trisha
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Executive Summary

WHAT

Detailed organization study of Tarasafe International, India's largest manufacturer of FR clothing.

Identified gaps and proposed strategies.

Redefined the business model to generate new revenue streams and complimentary assets. With a strategical roadmap in achieving company's vision of green building certification by mapping out the waste generated in the factory and ways of reduce it .

WHY

Through our research we found:

- The organisation is generating a huge amount of fabric waste
- Each department within the organisation is dependant on the supervisors for day to day decisions and the operators lack empowerment
- The organisation has a mechanised outlook and not a humanised outlook
- The Management aims to acquire a Green Building Certification for their Ahd Unit.

HOW

1. Identifying potential revenue stream
2. Building a complimentary assets for company.
3. identifying industry for collaborations.
4. Developing simple visual solution for proper inventory management.
5. Identifying waste control parameters for achieving company's vision (green building)
6. Developing a system to reduce wastage by empowering operators ---- eco-soldier

Abstract

Design audit examines the internal and external functioning of the organisation to identify gaps and opportunities for reorienting or rebuilding the strategy and vision of the organisation. The results of such analysis enable organisations to develop insights into their existing resources and come up with strategies to ensure judicious and efficient allocation of the same.

For the purpose of this Audit, the organisation chosen was Tarasafe International Pvt. Ltd., which was the first to introduce the concept of flame retardant protective clothing to the Indian Industry. Today, TaraSafe is the largest manufacturer of FR clothing in India.

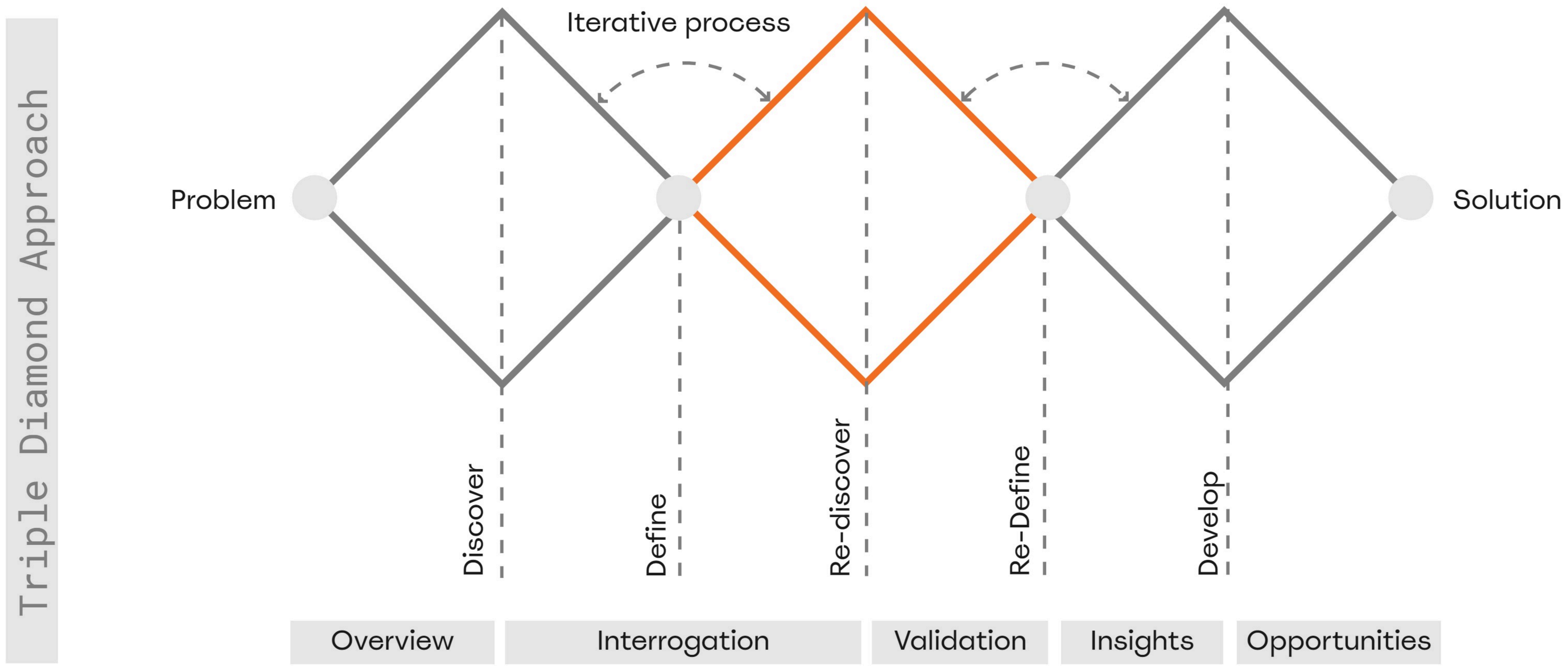
Objectives of Design Audit

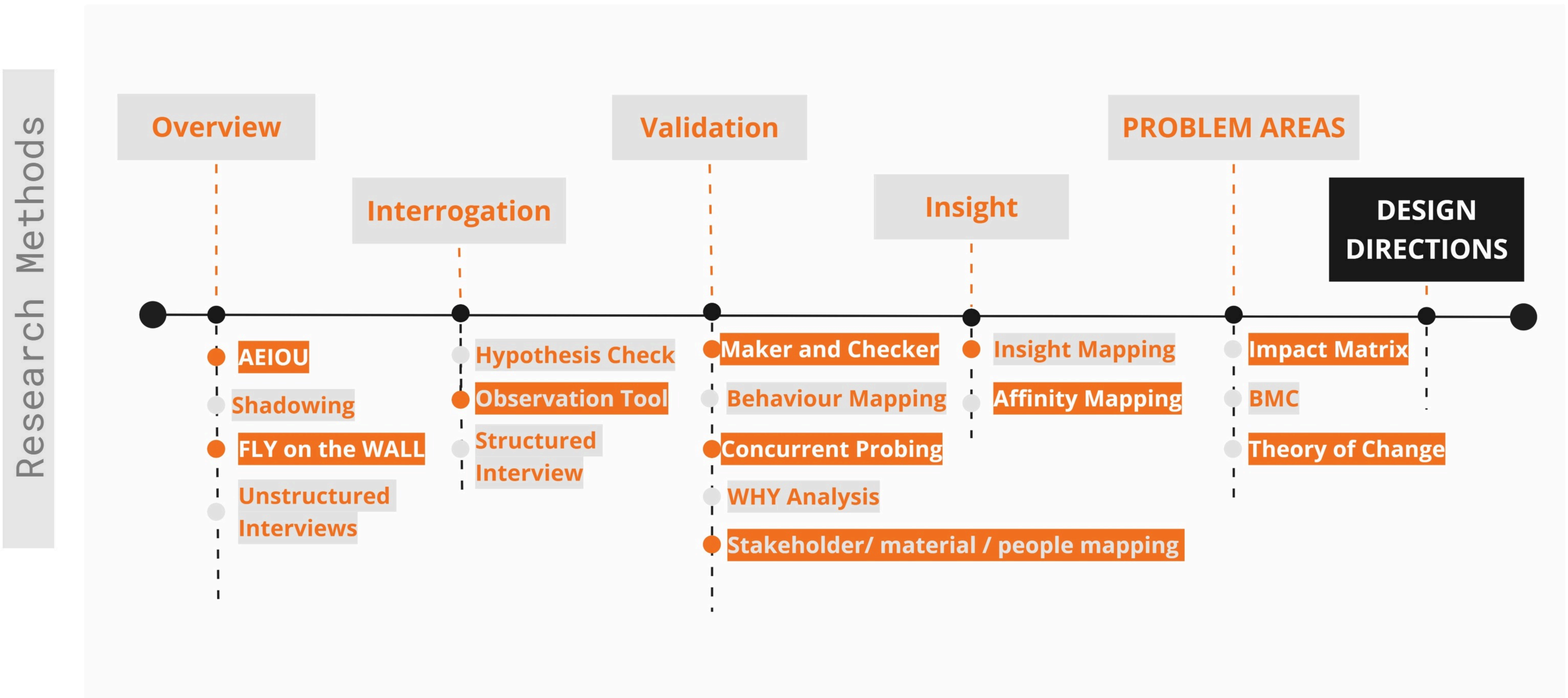
The following are the objectives outlined for this design audit:

1. To select an established organisation with multiple verticals and study its functioning, keeping in mind its stakeholders, internal and external environment.
2. To analyse the organisation's strength and weaknesses, and establish a performance profile
3. To identify opportunity areas for the organisation to stay ahead of the curve.

Research Methodology

For the purpose of this Audit, we designed and followed the **'Triple Diamond Approach',** that enabled us to analyse the micro and macro environment of the organisation.





Secondary Research

About Tarasafe

TaraSafe was the first to introduce the concept of flame retardant protective clothing to the Indian Industry . Over the years , an increased awareness of the importance of the FR clothing has changed the outlook of the potentially hazardous industries towards personal protection and safety . Today TaraSafe is the largest manufactures of the FR clothing in India .

ABOUT

VISION

Foster a culture of caring , trust , ethical behavior with stakeholders and society by achieving the highest standards of the quality of goods

MISSION

To empower customer to secure life , property and business by delivering high quality & Innovative Fire protection solutions

CORE

Producing quality and safety products as we care and want to protect lives of people .

MARKET

SEGMENT

Decades producing garment for different segments of FR industry like oil & gas , electric arc , molten metal splash , flash fire and chemical splash.

GEOGRAPHIC

Major focus in European , middle east , oceanic market with expansion in US and African market .

SHARE

India's largest producer of FR CAT-3 garments with annual turnover of **100 million USD .**

Flame Resistant Fabrics Market Size was valued over USD 4 Billion in 2016, and the industry will grow at a CAGR of up to 6.4% up to 2024. The overall FR market in Asia, Europe, and the United States in 2016 was around 1.8 million metric tonnes. It is estimated that the worldwide consumption of FRs will reach 2.8 million tonnes in 2024.

PORTFOLIO

PRODUCTS

Offer wide range of protective clothing solution like coverall ,Bib , jacket , shirt , trouser , balaclava

INFRASTRUCTURE

2 strategically located modern manufacturing units in Kolkata and Ahmedabad in **SEZ area** with **3000 per day capacity.**

CERTIFICATION

Poses different certification like UL , CE , ISO 9001:2008 , PPE-High risk CAT III ,SA 8000 , Sedex for producing quality and safety products.

COMPETITIOR

INTERNATIONAL

Bulwark , Lac-mac , Inno Tex , Marck & Balsan , Steel Grip

DOMESTIC

Arvind and Texport

COMPANY CERTIFICATION

Certifications

Tarasafe provide wide range of apparel product which provide safety against mentioned standards

Oil & Gas Industry

EN ISO 11612: 2008
Protection against Heat & Flame

EN 1149-5
Protection against Static Electricity

NFPA 2112
Protection of industrial personnel against flash fire

Molten Metal Splash

EN ISO 11611: 2007
Protective clothing for use in welding and allied processes.

EN ISO 11612: 2008
Protection against Heat & Flame

Electric Arc Industry

EN 61482
Protection against thermal hazards of Electric Arc

NFPA 70 E
Electrical Safety - American Standard

Hi-Visibility Industry

EN ISO 20471
High Visibility Warning

ANSI 107
High Visibility Warning (American Standard)

AS/NZS 1906.4
High Visibility Warning (Australian/New Zealand Standard)

High-tech electrical

EN 343
Protection against rain

Chemical Splash

EN 13034
Protection against Liquid Chemicals

Market Analysis

Market growth will **ACCELERATE** at a **CAGR** of over

6%

Growth contributed by **APAC**

35%

Incremental growth (% 8)

1.27

Growth for 2021

2.28%

Market is **FRAGMENTED** with several players occupying the market

According to Technavio , The flame retardant apparel market is **expected to grow by USD 902.10 million during 2020-2024.** Also it is set to grow by USD 1.27 billion, progressing at a **CAGR of over 6% during 2021-2025**.

The rapid growth in the **construction industry** is projected as one of the **major driver** for the flame retardant apparel market (and/or flame resistant clothing market) growth. The increasing requirement of employee safety and the safe workplace has presented the necessity of flame retardant clothing and assurance of the safety supervisor to provide the workers with reliable flame retardant clothing.

PPE Segment

Personal protective Equipment

PPE

Tarasafe are working in **PPE segment** where they are producing **Industrial Workwear garment** to protect workers from hazardous exposure like fire , arc flash , molten splash etc .

WHY

Personal protective equipment, commonly referred to as "**PPE**", is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards.

WHAT

Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests and full body suits.

HOW

By Safely designing and constructing the garment as per industry standards and certifying the garment to ensure the safety of the workers is not compromised .

Head Protection

Ear Protection

Eye Protection

Hand Protection

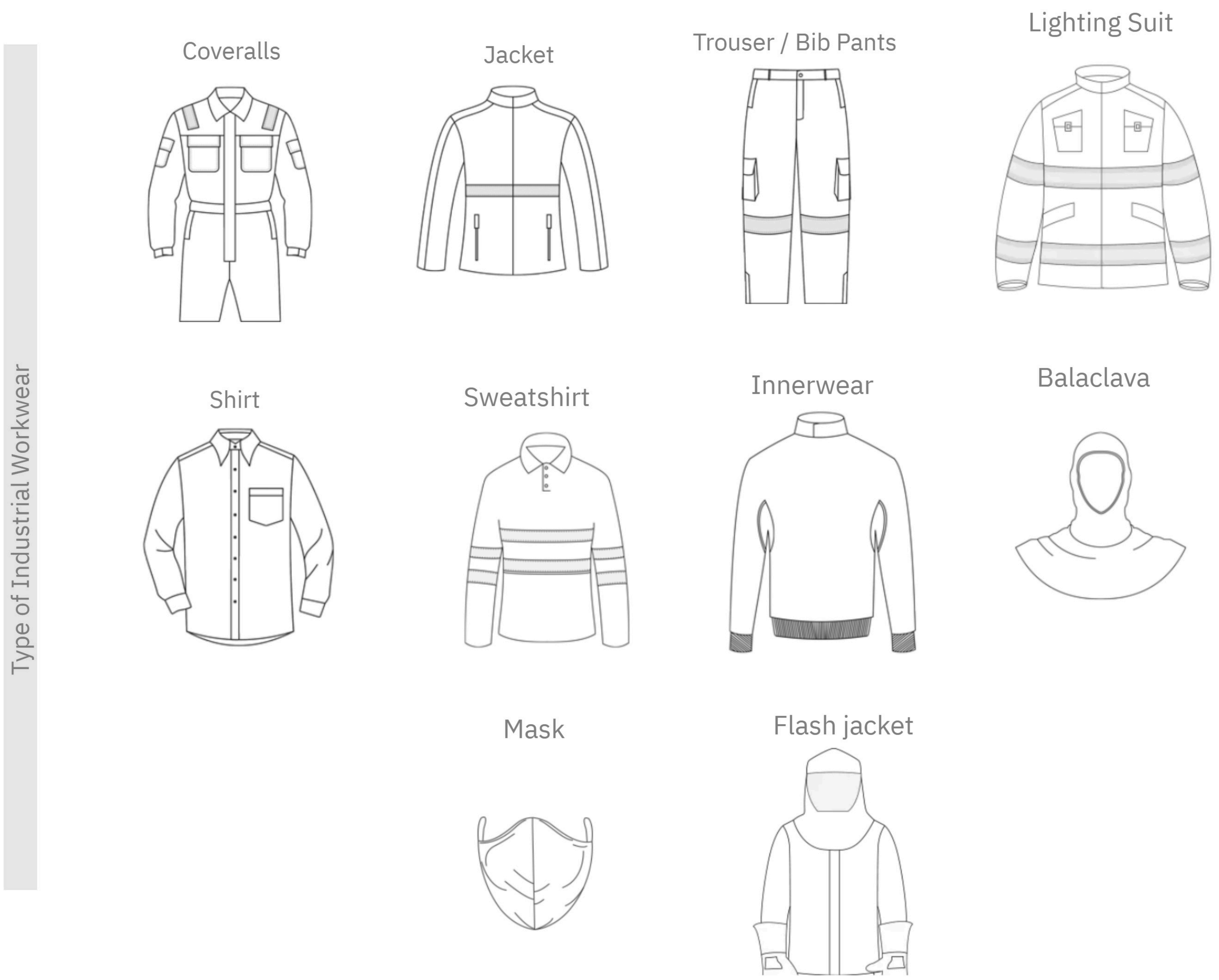
Foot Protection

Body Protection

Industrial Workwear

The word "**workwear**" means a coordinated uniforms that could not or would not be worn outside of work.
The clothing which is specifically designed to withstand punishing work environments i.e protecting workers from exposure of hazards knows as **Industrial Workwear** .

To identify how much protection garment is providing in a specific environment , certain parameters are defined to identify and to inform users to know protection level .



CAT

The CAT rating, short for PPE CATegory tells wearers at a glance the category of protection the garment (Arc rated / flame resistant) provides against injury in the event of an arc flash. It help users to select right CAT rating clothing as it has 4 category with its calories levels to describes the force of an arc flash the garment can hold or tolerate .

CAT1- 4.0 Cal | (Innerwear / garment closed to the body i.e 1st layer)
CAT2- 8.0 Cal |(Second layer i.e shirt / T-shirt)
CAT3- 25.0 Cal |(Triple layer Outerwear garment i.e jacket / sweater / sweatshirt)
CAT4- 40.0 Cal |(Outerwear garment i.e heavy jacket)

ATPV

Arc thermal performance value (ATPV) is a measurement of a **fabric's ability to protect** an individual from a burn due to exposure to incident energy resulting from an arc flash. It is the **incident energy on a material** that results in a 50% probability that sufficient heat transfer through the specimen is predicted to cause the onset of **second-degree burn injury** based on the Stoll Curve, cal/cm2.

The lowest value of the two (the ATPV or EBT) is used as the arc rating of the PPE under consideration, as **this value reflects the point at which the clothing's protective capacity is likely to fail**.

Ratings are based upon the total weight of the fabric. Appropriate clothing ranges from untreated cotton, wool, rayon, or silk materials with a fabric weight of at least 4.5 ounces per square yard to flame retardant (treated) clothing worn in layers.

FR Fabrics

Fabric can be converted in Flame retardant fabric by 2 methods :

a. Proban Treatment (At finishing stage)
b. Inherent Treatment (At Fiber stage)

Proban Treatment

Proban® is chemical which is applied to the fabric at the finishing stage i.e after dyeing of the fabric is done . It is used to impart a durable flame retardant treatment to cotton and other cellulosic fibres and blends. it The garment which are made up of Proban® fabric, poses FR properties to a certain period as it is applied to the outside of the fabric i.e the exposed surface . As per the standard a Proban® made garment last FR properties to 25 -50 washes .

Inherent Treatment

Inherent is treatment in which FR properties are induced at fiber stage which make the fabric permanently Flame retardant . Garment made out of inherent fabric will never loose it FR properties throughout its life . **Modacyclic** and **Aramid** are synthetic fibre which has highest flame resistance properties compare to any other synthetic fiber are the reason of being incorporated with cotton fiber to make the fabric more strong and pose permanent FR properties fabric .
These are fabric are more expensive compare to treated fabric because it will not ignite in normal oxygen content levels and have consistently higher Thermal Protective Performance (TPP) scores than treated FR fabrics.

UL Certification

What is UL Certification?

Underwriter Laboratories (UL) is one of the oldest safety certification companies around. They certify products, facilities, processes or systems based on industry-wide standards. By doing so, they issue over twenty different UL Certifications for a wide-range of categories. Certain UL Marks are country specific and will never be used or seen in the United States and vice versa. There is no such thing as general UL approval, instead they break up their certification into being listed, recognized, or classified.

UL Listed Service is given to manufacturers that produce products that meet UL's standards and gives the manufacturer authorization to test products and apply the UL mark themselves.

UL Recognized Service is applied to products used to produce another product, which indicates that it is safe to use in further production and it is not a mark that is seen on an end product.

UL Classification Service can be placed on products by a manufacturer that makes products that comply with UL's standards and maintains follow-up with UL to ensure quality and accuracy.

CE Certification

What is the CE mark?

The CE mark (above) is a symbol that a manufacturer (see definition below) affixes to a product so that it can be sold in Europe. The mark is mandatory for products which fall under one of 24 European directives. The CE mark means that the manufacturer takes responsibility for the compliance of a product with all applicable European health, safety, performance and environmental requirements. CE stands for "Conformité Européenne", the French for European conformity.

The mark is required in all 27 member states of the EU, as well as Iceland, Norway, and Liechtenstein. Switzerland accepts the CE mark for some products and Turkey actually requires that many products be CE marked.

ISO 9000

ISO 9000 standards were developed to help manufacturers effectively document the quality system elements that need to be implemented to maintain an efficient quality system. They are increasingly being applied to any organization or industry. ISO 9001 is now being used as a basis for quality management—in the service sector, education, and government—because it can help organizations satisfy their customers, meet regulatory requirements, and achieve continual improvement.

The ISO 9000 series, or family of standards, was originally published in 1987, by the International Organization for Standardization. They first gained popularity in Europe, and then spread to the U.S. in the 1990s. As the world's view of quality assurance has evolved, these standards have been revised, in 2000 and 2008.

Today, quality management is understood to be about processes that need to be properly managed, both technically and in terms of human resources. Current versions of ISO 9000 and ISO 9001 were published in September 2015.

Key Takeaways:

- ISO 9000 is a set of internationally recognized standards for quality assurance and management
- ISO 9000 lays out best practices, guidelines and a standard vocabulary for quality management systems
- ISO 9001 is the only certifiable portion of these standards, with updates published in the year 2015

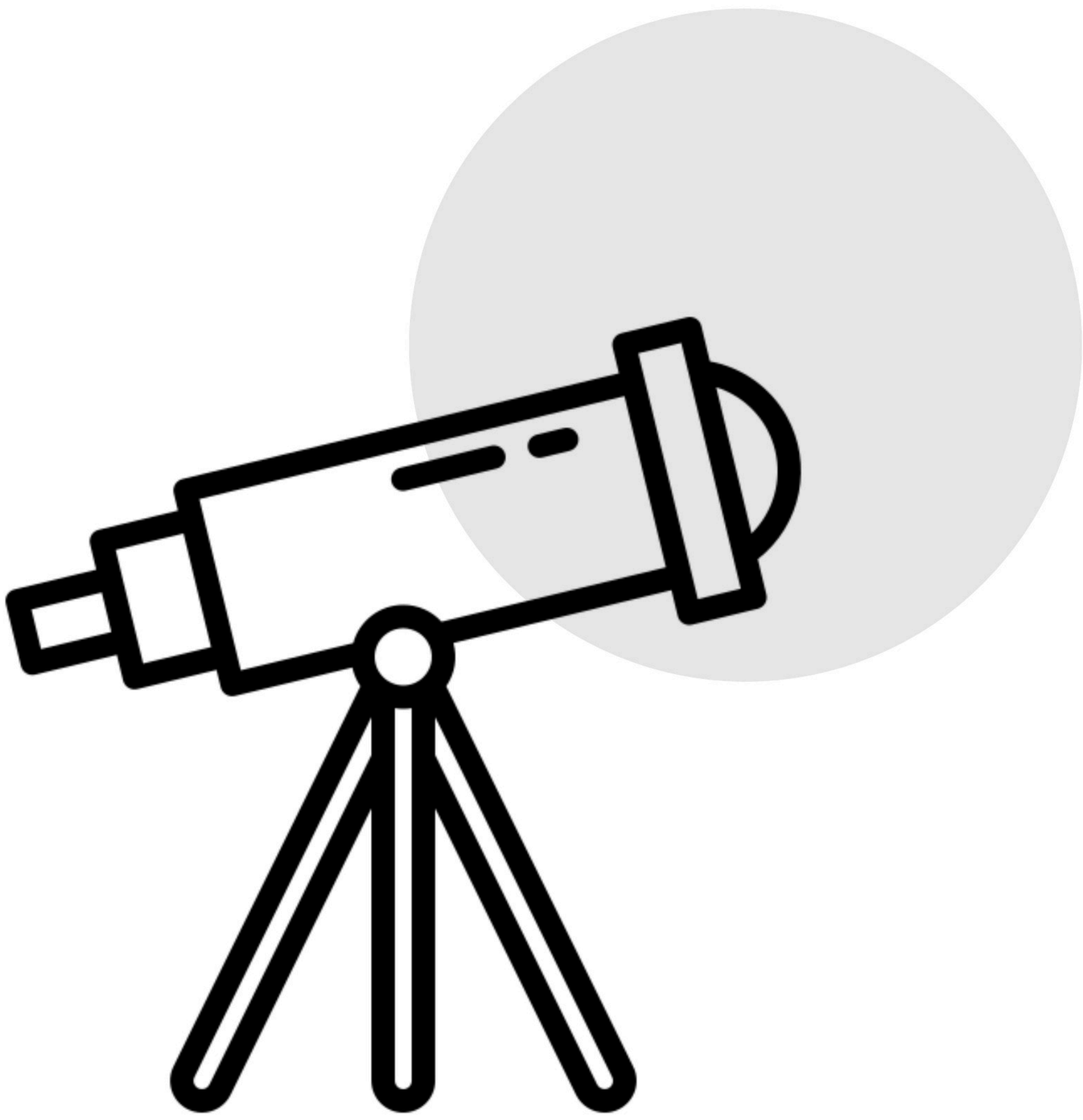
Primary Research

Discover

The stage of discovery focused on getting an **overview of the organisation**.

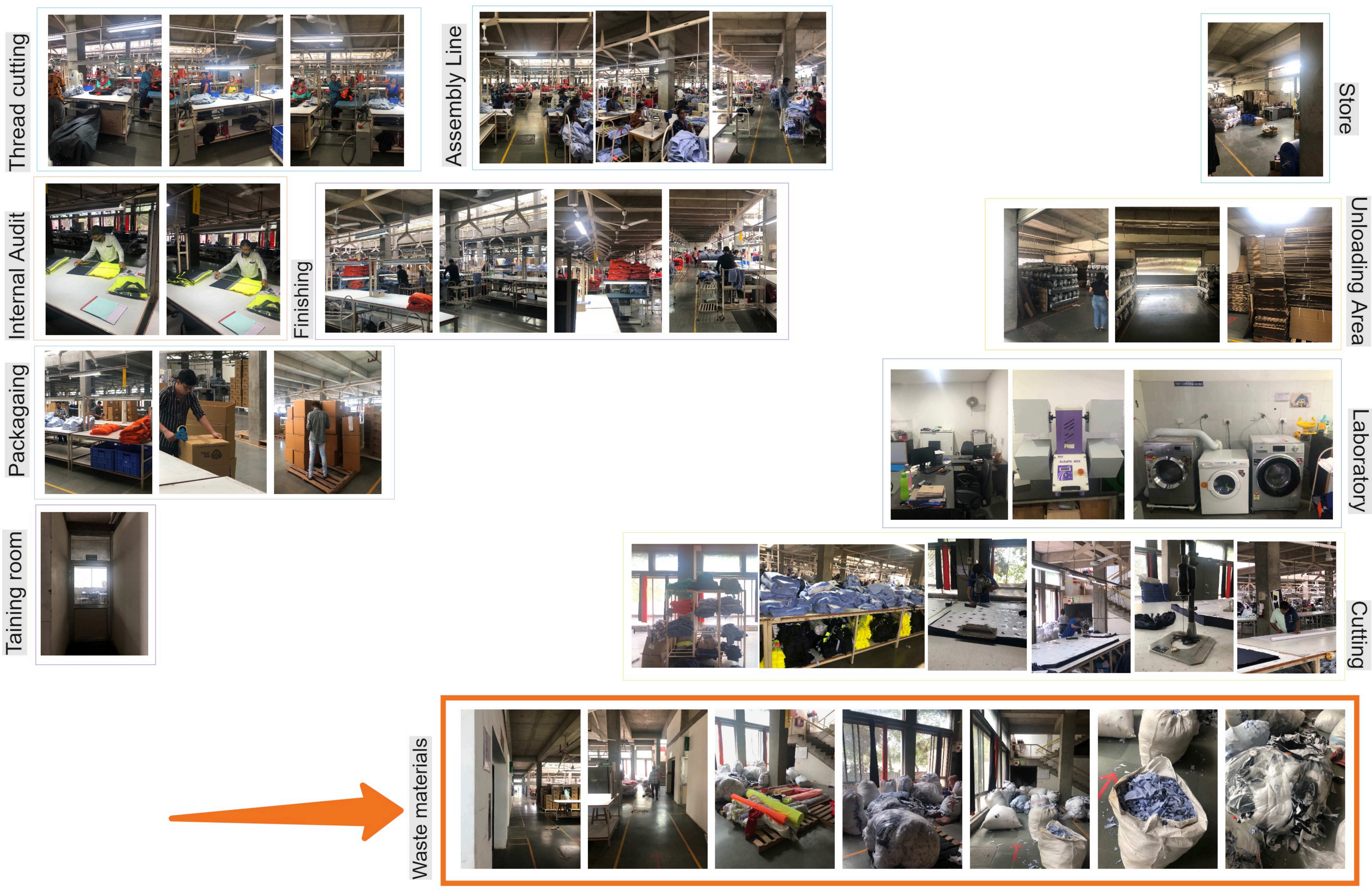
It involved **critical examination** of each and every facet, in hopes to uncover interesting insights

TOOLS: AEIOU, Shadowing, Fly on the Wall, Unstructured Interviews



Observation

Through the stage of discovery, the aim was to identify and observe the organisation to get a macro perspective. It involved critical analysis of every facet, in hopes to discover insights that would direct this research.
We tried to encapsulate our observations in a visual format, with photographs from all departments for an apple to apple comparison



Hypotheseis

Based on the observations, we came up with the following hypotheses :

- Each department is highly dependent on the supervisor for its daily functioning. This makes it difficult to trace back any information in their absence.
- The cutting stations are generating a lot of fabric and paper waste which are not segregated and simply stored in bags. Incorrect handling of chemically treated fabric can have a negative impact on the environment.
- Unclear segmentation and labelling in the storage which results in an inefficient inventory management system. This increases the time required to identify, find and issue materials.
- Data from every department is tracked manually and in different formats. This creates an issue in keeping track and analysis of important information.
- The lab only tests a swatch against the whole fabric roll which does not ensure that the entire roll is defect free. Thus, adding to fabric waste in case any defects are encountered later in the process.
- During the whole production process, there is a significant amount of plastic waste generated at various stages such as store, finishing, internal audit etc.

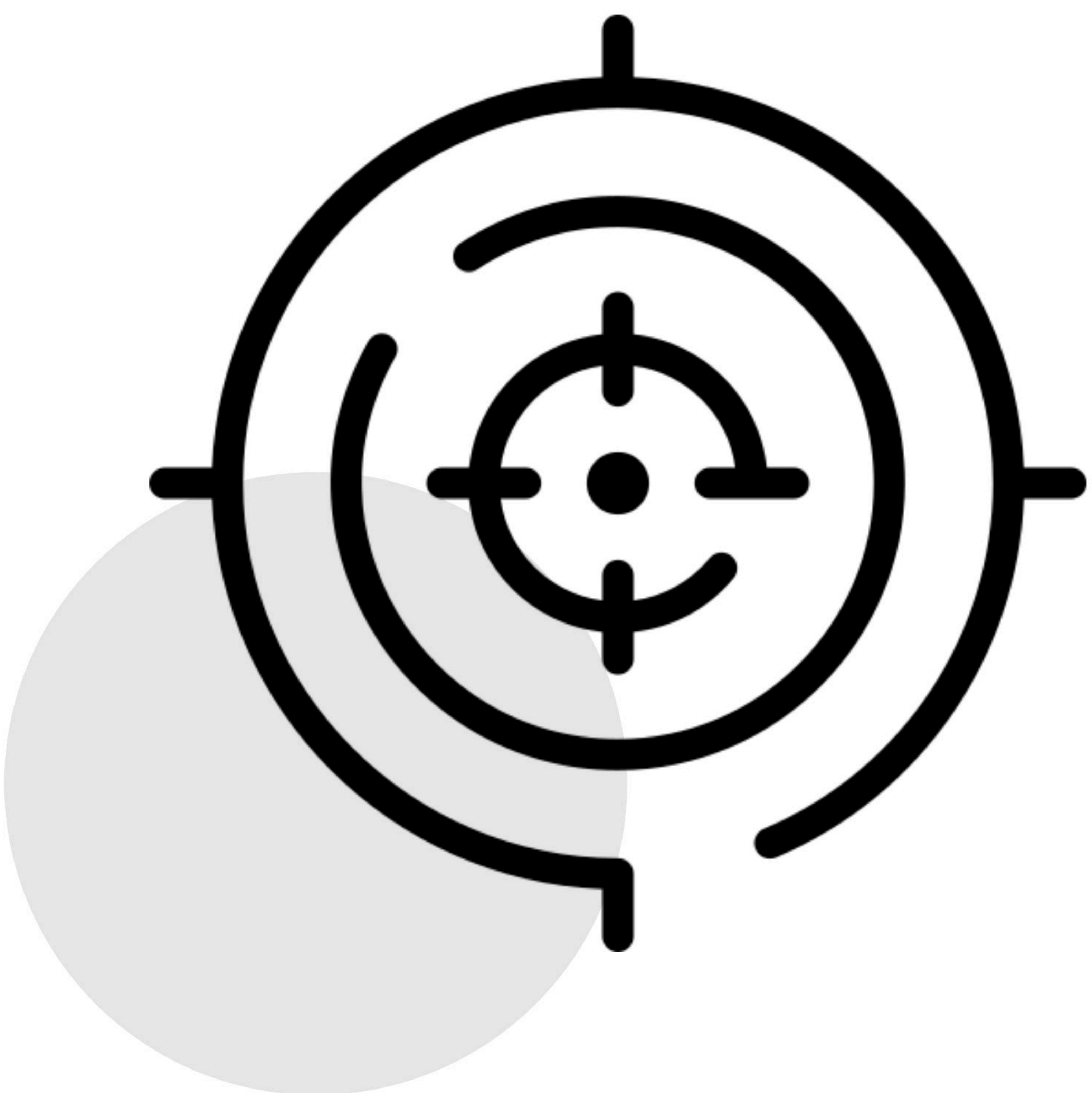
Through this stage we discovered the area of **waste generation and management**. Keeping this in view, we moved towards the next stage of defining the issues.

Define

The observatory research discovered the area of **Waste generation and management**

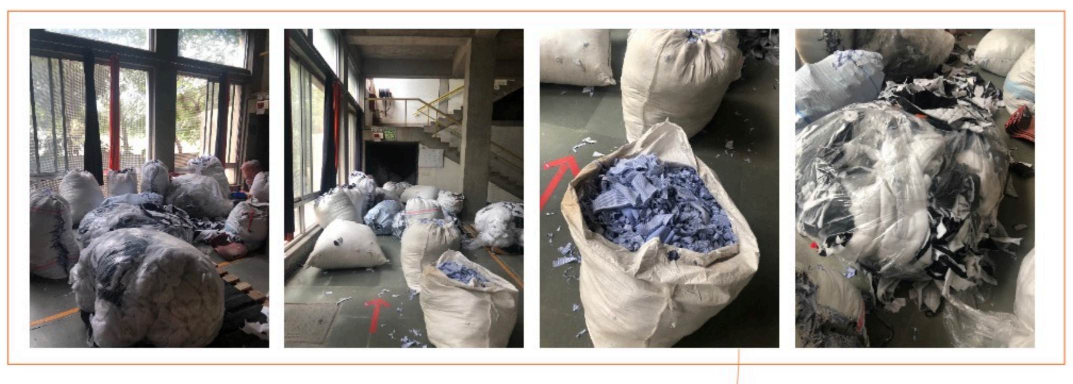
Defining the issues further, the research was directed at **understanding the current context of the organisation**

TOOLS: Structured Interviews, Hypothesis Check, Observatory tools

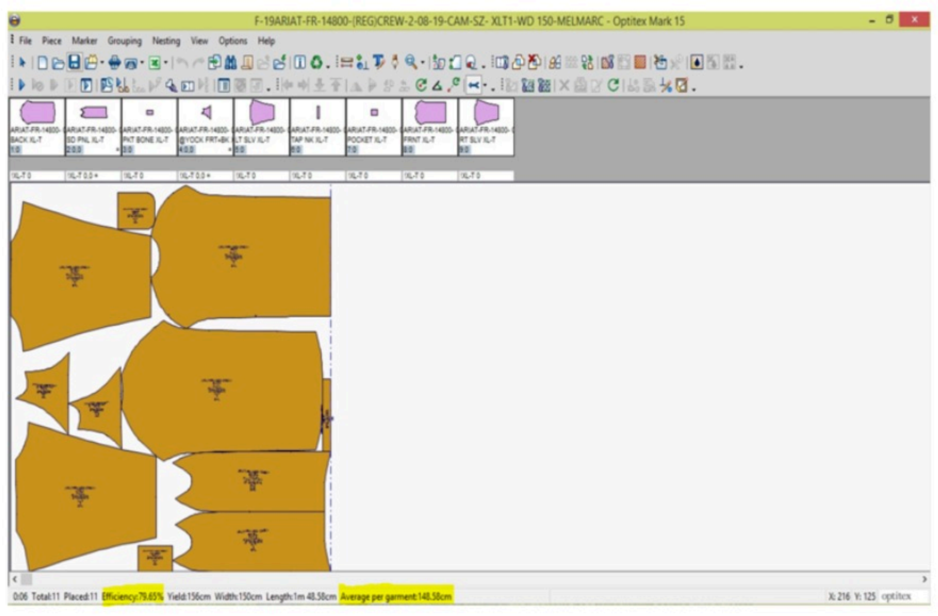


Interrogation

The research was now directed towards understanding the issue of waste generation and management within the organization. For this we interviewed the stakeholders- Management, Department Heads, Operators.
This directed research shed light on ‘how waste is being generated within the organisation. We found:



Cutting Marker , A paper with multiple pattern sequences laid on the fabric lay in order to cut the parts of garment



Negative space in the pattern marker is the cause of wastage

Due to **curved lines in pattern** create **negative space** which affect the **marker efficiency** .

Annually **wasting fabric worth of 30 Lakh rupees .**

We attempted to calculate the wastage per lay, per day, monthly, and per year

- Marker Efficiency : 90%
- Marker Length : 5 mt
- Per lay wastage : 10%
- Fabric cost : 240 per mt
- Total cost wastage per lay :10000 rupees per mt
- Total cost wastage per month : 1 Lakh
- Total cost wastage per year : 10 Lakh

Interrogation

On average, the cutting department cuts 3 lays, which means they produce waste of 30 lakh which is a huge amount of money . Furthermore, we found that less than 30% of the solid Waste is segregated and scientific disposal of waste is almost is never practiced (MoUD GOI 2010)
In light of the above information, we attempted a SWOT and PESTEL Analysis of TaraSafe

SWOT Analysis

STRENGTHS

- **Pioneers** in FR clothing in India
- Innovation and Growth Mindset
- Prime **SEZ Location**
- Work on **small orders** as well
- First to get **certified on producing a category III garments in India and CE certification**

OPPORTUNITIES

- **Make In India**
- New Markets for raw Materials
- New Segments
- JV's and tie ups
- **Waste management**
- CSR

WEAKNESSES

- **Decentralised** setup
- **Demarcation** of roles and responsibilities not defined .
- Non inclusive building
- **Disorganised** Store Management
- Not a lean manufacturing unit
- **Absence** of **Safety measures** for employees
- No visual checking of Fabric roll
- Not a vertical manufacturing unit

THREATS

- Dependency on Suppliers for Raw materials
- Indo-chinese relationship
- Vertical manufacturing units

PESTEL Analysis

Re-Discover

Using **Waste Management as a lens** to look at the entire organisation.

Mapping out the various **internal stakeholders and information flow**

TOOLS: Stakeholder Mapping, Structured Interviews, Hypothesis Check

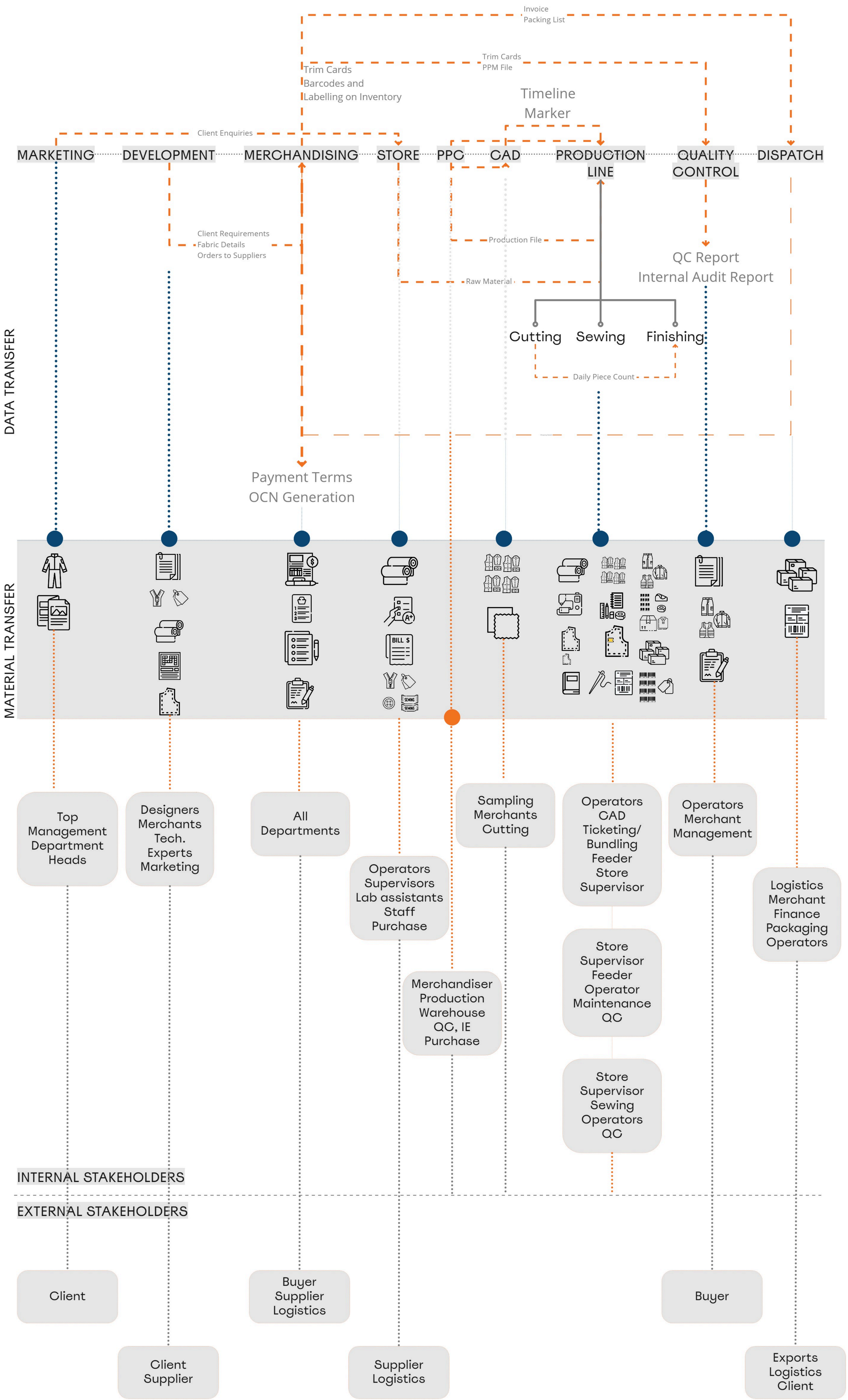
Defining the waste generation and management issues raised more questions such as

> What kinds of waste is being generated?
>
> Why is TaraSafe generating so much waste?

To answer these questions, we proceeded to create a Waste Map, a diagram that outlined the movement of materials and waste generated across the various departments. This allowed us to categorise the different kinds of waste that was being generated within the organisation. What stood out to us, was that the waste due to human errors existed in over 70% of the departments. This piqued our interest, and we set out to understand the reasons behind the same.

We followed up this activity with another mapping exercise, wherein, we mapped the flow of materials and data within the organisation, and the stakeholders involved, both internal and external

Flow



Invoice
Packing List
Trim Cards
PPM File
Trim Cards
Barcodes and
Labelling on Inventory
Timeline
Marker
Client Enquiries
MARKETING
DEVELOPMENT
MERCHANDISING
STORE
PPC
CAD
PRODUCTION LINE
QUALITY CONTROL
DISPATCH
Client Requirements
Fabric Details
Orders to Suppliers
Production File
Raw Material
QC Report
Internal Audit Report
Cutting
Sewing
Finishing
Daily Piece Count
DATA TRANSFER
Payment Terms
OCN Generation
MATERIAL TRANSFER
BILL $
Top Management Department Heads
Designers Merchants Tech. Experts Marketing
All Departments
Operators Supervisors Lab assistants Staff Purchase
Merchandiser Production Warehouse QC, IE Purchase
Sampling Merchants Cutting
Operators CAD Ticketing/ Bundling Feeder Store Supervisor
Store Supervisor Feeder Operator Maintenance QC
Store Supervisor Sewing Operators QC
Operators Merchant Management
Logistics Merchant Finance Packaging Operators
INTERNAL STAKEHOLDERS
EXTERNAL STAKEHOLDERS
Client
Client Supplier
Buyer Supplier Logistics
Supplier Logistics
Buyer
Exports Logistics Client

These mapping exercises were done through intensive interviews with the stakeholders, to understand the nuances of each department. This gave us a few interesting verbatims that added a lot of value to the research :

“

- *Unused garments, if kept in storage for around 2 years, it loses it worth.*
- *For us, feasibility is more important than style or looks.*
- *The communication gaps are high-and packing complaints too, pallets, cartons open during travel, labelling of boxes is wrong etc.*
- *There’s no inspection here, or testing-we use the mill reports we get with the delivery.*
- *There’s usually no trace of where things went wrong.*
- *If there’s a fabric defect in between sewing, I write it down and keep the garment with me and wait to inform the roaming QC.*
- *We are questioned if the output target is not met and say out of 1000 pieces, 100 are damaged or don’t pass the QC, our payment is affected.*
- *Repair takes more time, approx 10 in a single lot.*
- *We are aiming at getting a Green building certification soon, it’s part of our 5 year plan.*
- *There is no single file of the data for an order, in fact trims are also with just 2 people.*
- *We’re not scared of any competition, we’re confident as we are pioneers.*
- *I have 2 notebooks, one rough for myself and one which we have to submit so that nothing is missed.*

Using this information, we moved towards understanding the reason behind frequent human errors within the organization.

Data Analysis

Re-Define

Looking at the organisation through the lens of Waste, brought to fore an interesting question

Why is the organisation generating waste?
Especially when the organisation is aiming for a green building certification, which carries 13 points for Waste Management

"Waste is the result of inefficiency"

TOOLS: Concurrent Probing, Lean Waste, Maker-Checker, Behaviour Mapping

To analyse the data we had collected in the previous stage, we attempted to understand the **reasons behind the high frequency of human errors across departments**. For this we adopted the Lean Manufacturing framework that outlines 8 types of waste in manufacturing. The reason behind choosing Lean manufacturing framework was TaraSafe's claim of being a Lean manufacturing unit.

Lean Manufacturing

Lean is the systematic approach to identifying and eliminating waste through continuous improvement by flowing the product or service at the pull of your customer in pursuit of perfection. The waste generated at TaraSafe was categorised under the 8 categories of this framework

The waste generated at TaraSafe was categorised under the 8 categories of this framework :

TRANSPORTATION	Wasted time, resources, and costs when unnecessarily moving products and materials.	Panels Alterations Communication Information Tracing
INVENTORY	Wastes resulting from excess products and materials that aren't processed	Rejected Fabrics/ Rolls Improper Storage Incomplete Communication
MOTION	Wasted time and effort related to unnecessary movements by people or machines	Defected Fabric Lays Alterations and QC Dependency on Supervisors
WAITING TIME	Wastes from time spent waiting for the next step to occur	Design communication Lack of complete information to operators maintenance of records
OVER PRODUCTION	Wastes from making more product than customers demand	---
OVER PROCESSING	Wastes related to more work or higher quality than is required	Defected Panels are exchanged Alterations due to lack of info. of quality standard at operator level
DEFECTS	Waste from a product or service failure to meet customer expectations	Fabric defects Trims and Labels Workmanship
UNUSED TALENT	Wastes due to underutilisation of people's talents, skills, and knowledge	Lack of responsibility Centralised decision making Dependancy on supervisors

“How does this waste affect us (TaraSafe)?”

40pcs

Average Panel Replacement
Loss per order= 2%
Cost/ Panel= 160 INR
Total Loss/ Order= 12,800 INR

Loss/year= 1,10,97,600 INR*

**Assuming 20 panels are needed per garment*
Cost of fabric= 320 INR
Maximum replacement are front panels
Order Qtty= 100pcs

10%

Alteration rate per order
Avg repair time= 6mins
Total repair time/order= 600 mins
Running costs= 5 INR
Total cost of repairs= 3000 INR
Yearly loss due to repairs=
7,20,000 INR #

#Assuming an order of a 1000 pcs
Garments to be altered = 100 pcs

30Lacs

Cost of waste produced
Marker Efficiency= 90%
Marker length= 5mt
Cost wastage/lay= 10,000 INR
Daily wastage with 3 lays= 30,000 INR

+Fabric Cost= 240 per mt

60Mins

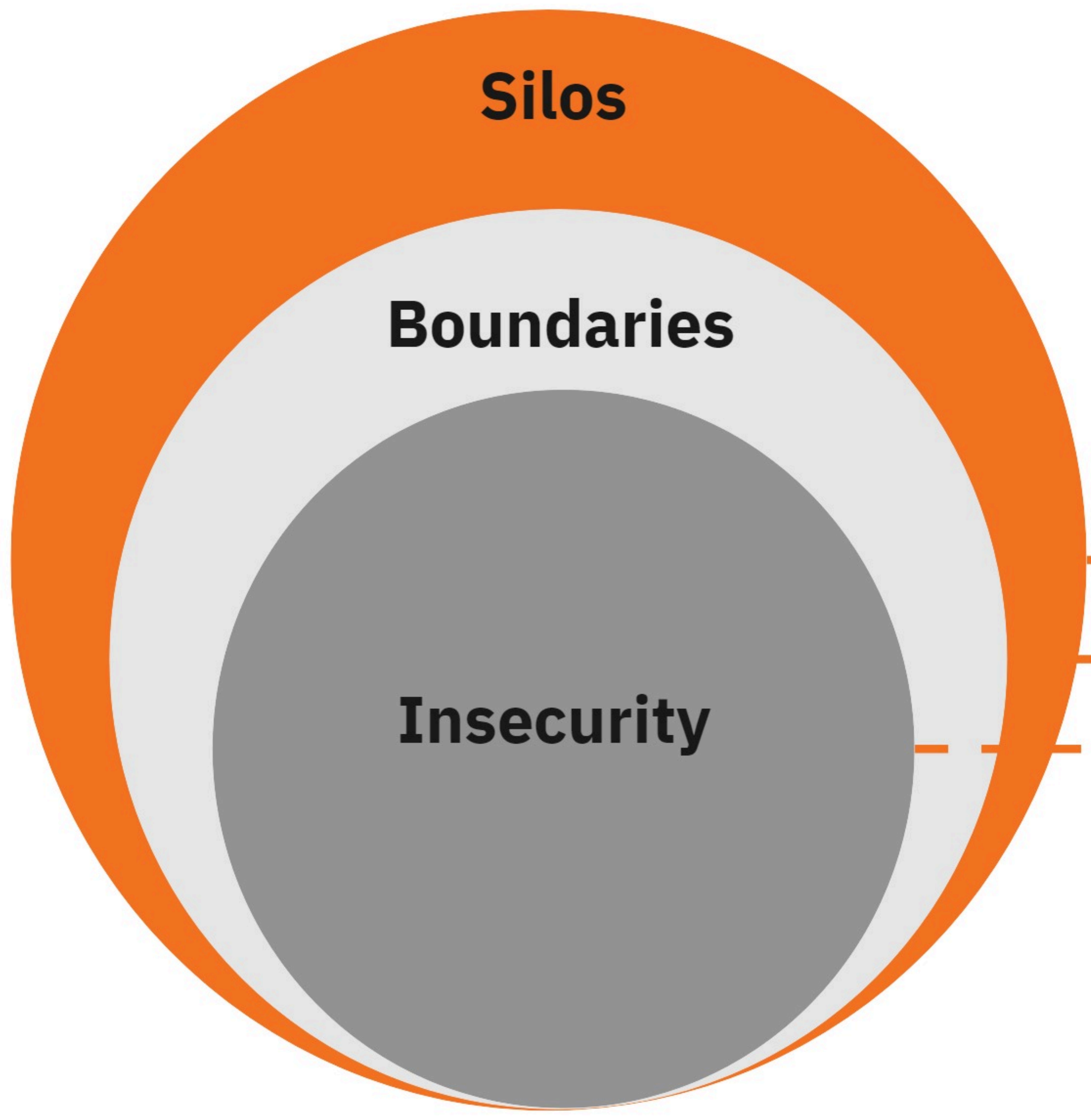
Avg time to take a decision
Running cost/min= 5 INR
Total cost/hour/ decision= 300 INR

Yearly losses= 4,33.500 INR &

& Assuming 5 such decisions are taken a day

Culture @ TaraSafe

Through this process, we also got a glimpse of how the culture at TaraSafe is.



Piece Rate System

Operator are resources , **no need investing in training**

Which makes them **dependent on supervisor** there to take decision.

Fear of losing their skilled operators.

&

Machine and **brain mindset**

Restrict lower level management **to share their problem** or issues with upper management

As management will not understand and **end up losing job.**

High Alteration Rate

Limited information is shared between departments as centralised decision making by top management

Lack of **ownership**, **responsibility, accountability** and **proactiveness** amongst the workforce

Hence **vision of Safety and Quality** have **not percolated** within the organisation

Everyone making own system

following std system is burden to them

Because management haven't ask what operator want

Because management doesn't include operator while preparing system

Following the mindset of Brain and Machine mindset

Performance Profile

To make sense of all the data collected till date, we created a performance profile for TaraSafe. For this we referred to the New Design Management Framework by Fulden Topaloğlu & Özlem Er, and tailored it to the specific needs of our organization.

DIMENSIONS	CRITARION	POTENTIAL MEASURES	RATING					MEAN	TOTAL MEAN
			Excellent (5)	Good (4)	Acceptable (3)	Marginal (2)	Poor (1)		
Purposeful	Efficiency	Cost per unit of output						2.4	2.46
		Fixed Asset utilization rate							
		Revenue Multiplier							
		Alteration Rate							
	Productivity	Rejection						1.5	
		Unit produced over capacity							
		Infrastructure Utilization							
	Stability	Planning						3.5	
		Iteration Rate							
		Compliance with established procedures							
		Alignment of strategy , mission , vision							
Adaptable	Innovation	R&D expenses as percentage of net revenue						3.42	2.75
		Training as percentage of net revenue							
		New product development rate							
		No. of new market entered in 2021							
		Advertisement / Branding							
		Willingness to innovate							
		Operational process change frequency							
	Growth	Profit growth during 2020						2.6	
		Relative market share change							
		Change in manpower							
	Evaluative	Feedback system utilization						2.25	
		Performance management system utilization							
		Task force utilization							
		No. of new initiative launched							
Harm Minimisation	Inter Organisational	Ethics						3.4	2.75
		Workforce training							
		Monitoring Systems							
		Organisational Justice							
		Accidents							
	Intra Organisational	Regulatory Compliance						2.5	
		Ecological Footprint							
		Environmental Sensitivity							
		Philanthropic activities							
Sustainablity	Output Quality	Customer satisfaction						3	2.8
		Customer Loyalty and Retention							
		External Reviews							
		Internal Quality Measures							
		Service Errors							
		Response Time							
	Information Management	Role Ambiguity						3.2	
		Integrity Of Information							
		Timeliness Of Information							
		Staff Meetings							
		Access to Procedures, rules and regulations							
	Conflict Cohesion	Workgroup Cohesion						2.4	
		Employee Turnover							
		Absenteeism							
		Workplace incivility							
		Commitment							

Profile Key

Compliance with established procedures	EXCELLENT
New product development rate	
Willingness to innovate	
Accidents	
Regulatory Compliance	
Customer Loyalty and Retention	
External Reviews	
Access to Procedures, rules and regulations	
Cost per unit of output	GOOD
Iteration Rate	
R&D expenses as percentage of net revenue	
No. of new market entered in 2021	
Ethics	
Customer satisfaction	
Staff Meetings	
Commitment	
Alteration Rate	ACCEPTABLE
Infrastructure Utilization	
Training as percentage of net revenue	
Feedback system utilization	
Environmental Sensitivity	
Internal Quality Measures	
Response Time	
Workgroup Cohesion	
Workplace incivility	

Revenue Multiplier	MARGINAL
Rejection	
Unit produced over capacity	
Alignment of strategy , mission , vision	
Operational process change frequency	
Relative market share change	
Task force utilization	
Workforce training	
Ecological Footprint	
Philanthropic activities	
Service Errors	
Role Ambiguity	
Integrity Of Information	
Fixed Asset utilization rate	POOR
Planning	
Advertisement / Branding	
Profit growth during 2020	
Change in manpower	
Performance management system utilization	
No. of new initiative launched	
Monitoring Systems	
Organisational Justice	
Timeliness Of Information	
Employee Turnover	
Absenteeism	

Leverage Points

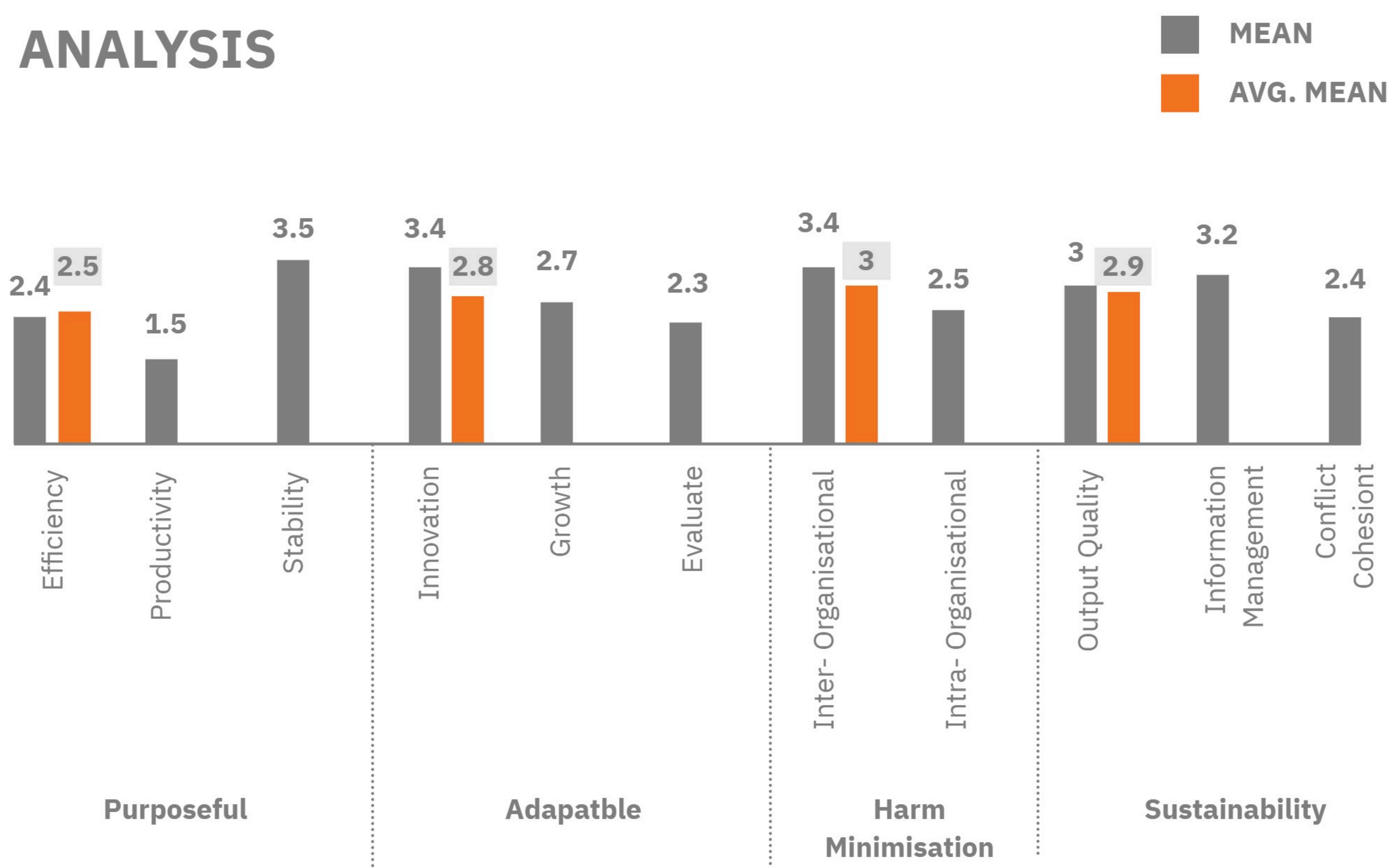
The performance profile created a transparent report card for TaraSafe that helped us empirically identify their strengths and weaknesses. We aligned ourselves to their strengths, treating them as leverage points that would enable us to design strategies that would aid them in achieving their vision.

1. New product development Rate
2. Willingness to explore new market
3. Adequate budget allocated to R&D

Adequate budget allocated to R&D

- Lower the waste % by lowering the alteration rate
- Increase the contribution in environmental sensitivities
- Help in achieving the mission, vision and strategy i.e Green Building Certification

ANALYSIS



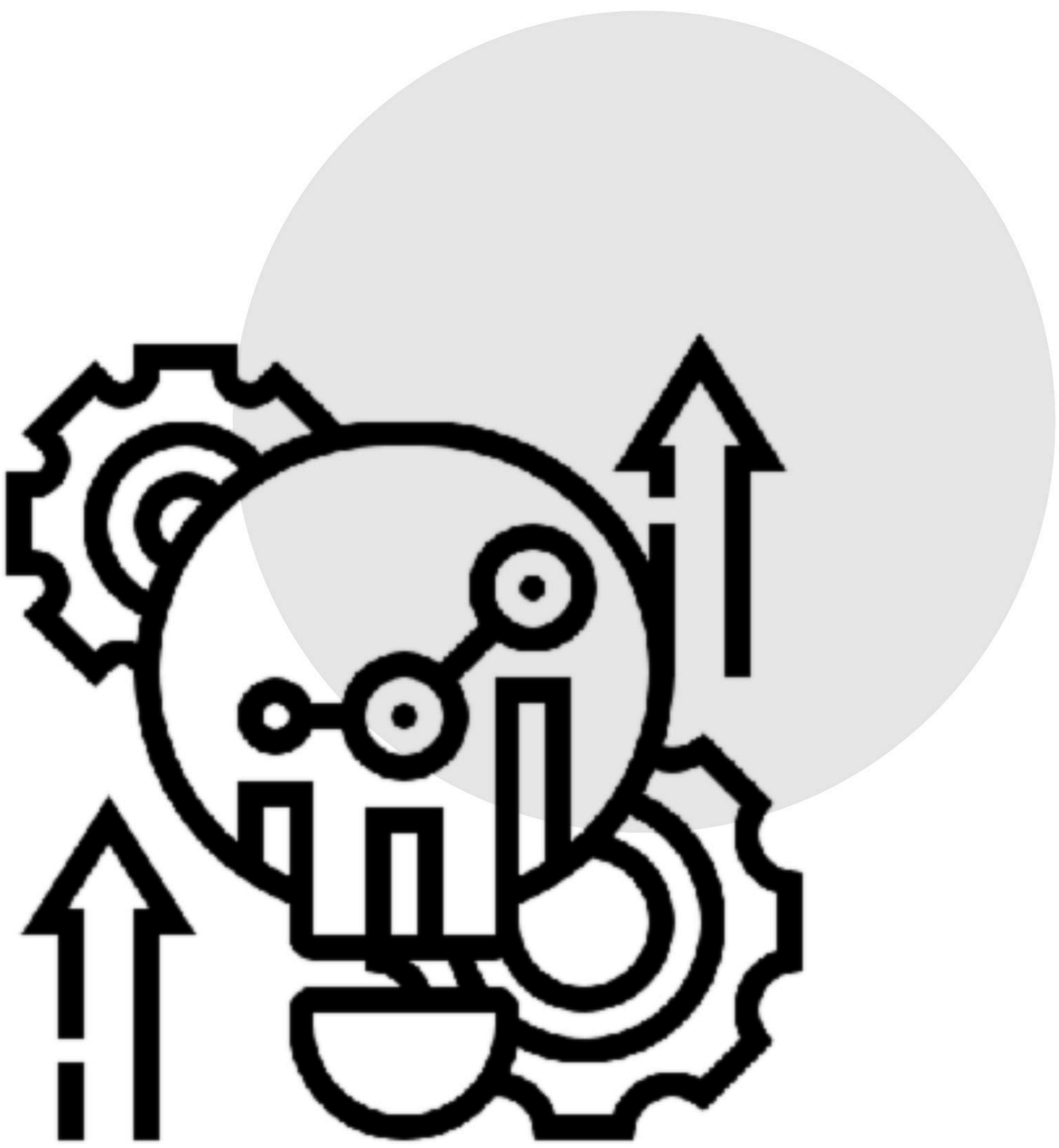
Design Directions

Develop

To develop **strategies for the future, Need statements** were articulated.

These statements were further used to create a **strategic road map for the organisation.**

TOOLS: Insight Mapping, Impact Matrix, Business model canvas, WHY Analysis



Insights

The insights were categorised under three major headings:

WASTE DISPOSAL

The lab only test a swatch against the whole fabric roll which does not ensure that the entire roll is defect free. **Thus, adding to fabric waste due to defects encountered later in the process.**

The cutting stations are generating a lot of fabric and paper waste which are not segregated and simply stored in bags **because no one cared about it as it is non-value activity**

MANAGEMENT

Each department is highly dependent on the supervisor for its daily functioning because **operator are not trained to take decision**.

Unclear segmentation and labelling in the storage which results in an inefficient inventory management system, increasing the time required to identify, find and issue materials.
process are made without considering them.

DATA ENTRY

Data is recorded twice by operators, first in a rough format which is faired out later resulting in loss of data and extra time consumption because **following std are burden as system are not made considering them .**

Need Identification

There is a need to create multiple checkpoints to precisely test the fabric roll and reduce wastage.

The management is aiming for a Green Building Certification. Material and resource management carries a reasonably high score in the criteria for getting a Green Building Certification.

Textiles can take up to 200+ years to decompose in landfills. According to the World Resources Institute, it takes 2,700 liters of water to make one cotton shirt. Incineration and landfill of FR textiles produce large toxic outcomes.

There's a need to explore methods of better waste disposal system.

Vertical manufacturing units pose a threat to TaraSafe as they are equipped to cater to their own material waste internally.

There's a need for a robust store management system to solve this problem.

Current centralised management system takes away the sense of responsibility from the employees.

Slows down the process, reduction in efficiency, higher alterations.

There is a need for a more efficient, inter connected internal communication system that reduces dependency on few individuals.

Reduced efficiency of store

Will make it easier for other individuals to locate and procure needed items without being dependent on a single entity.

There is a need for another way of data entry in the organisation, which reduces the redundancy of the process

The current system of data entry adds to the work of operators.

They work on a piece based incentive system and this takes away from their 'work' time.

Unsystematic way of manual data entry results in data loss.

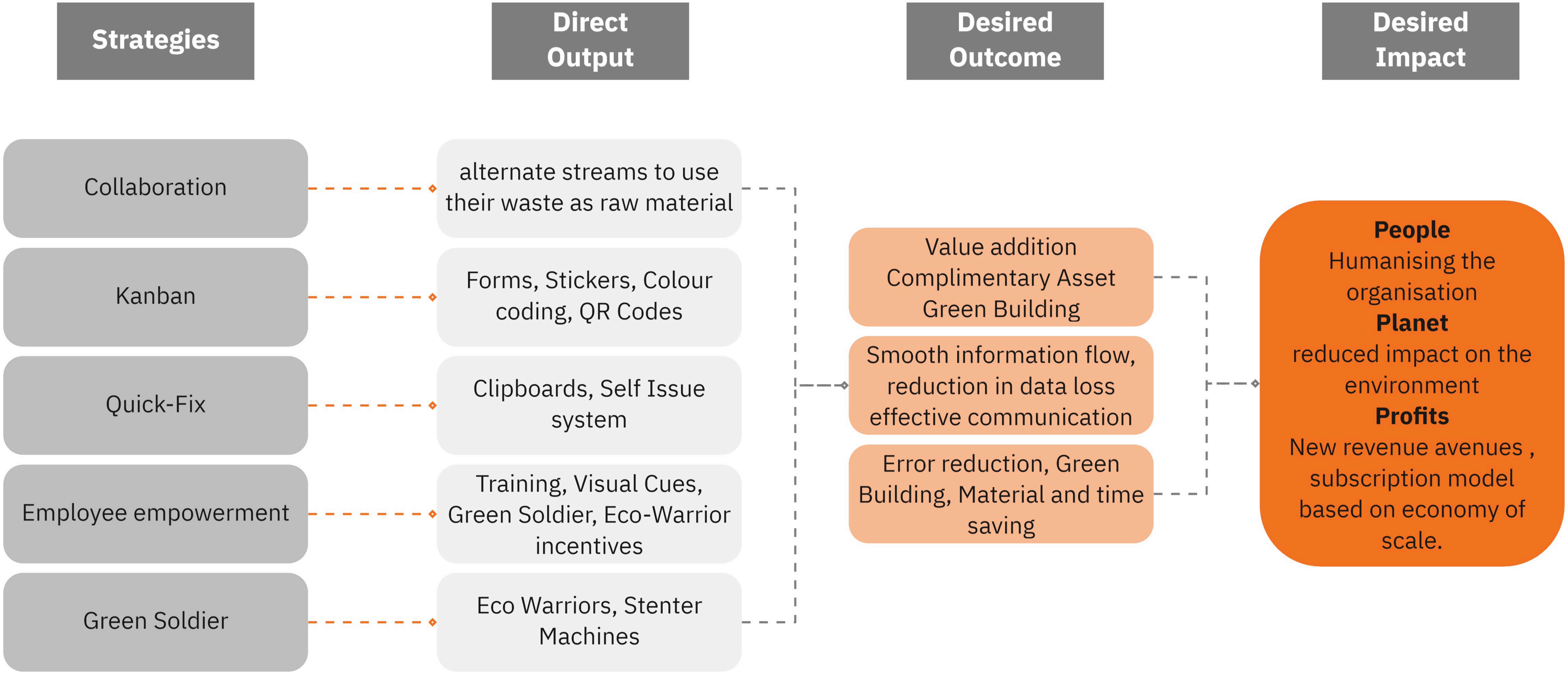
Need Statement

Why Analysis

Strategic Road Map

	KEY PROBLEM	SHORT	INTERMEDIATE	LONG
SHORT	There is a need to create multiple checkpoints to precisely test the fabric roll and reduce wastage.	A visual guide of the kind of defects that lead to rejection for operators	Stent Machines to test Fabric	Self produce fabric
		Eco Warriors/ Green Soldiers based on the quality of work/ incentive	Local Suppliers	
	There's a need to explore methods of better waste disposal system.	Segregation of waste- fabric (FR/ Non FR), paper, plastic	Sell the fabric waste to an organisation that uses it as raw material	Infrastructure to shred and treat fabric waste to create raw material for other industries (Business Innovation)
INTERMEDIATE	There is a need for a more efficient, inter connected internal communication system that reduces dependency on few individuals	Visual instructions that allow them to take small , day to day decisions	Employee training to educate them about the process and Quality of steps preceding and succeeding them	
LONG	There's a need for a robust store management system to solve this problem.	Easy to use tools for keeping inventory in the store (Clip board with a sheet and pen)	Self issue system- find your non fabric material and get it issued	
	There is a need for another way of data entry in the organisation, which reduces the redundancy of the process		Data entry to be integrated with the daily work process of the operators through stickers, simpler forms, QR codes	

Theory of Change



Impact Matrix

Business Model Innovation

Proposed Innovations | 24th December 2021

Key partners
What are your key partners to get competitive advantage?

- Arvind Mills
- Vardhman
- Xinxiang Zhuocheng Special Textile.co LTD
- FR Fabric supply from China
- HDS Logistics Solutions
- BTTG
- Bureau Veritas
- Sedex
- IIT (R&D)
- Intra Tech (Lab)

- **Chindi**
- **Dwij**
- **Arvind Mills**
- **Coats**
- **Twiga**
- **Automobile Seat Manufacturers**

Key activities
What are the key steps to move ahead to your customers?

- FR Garment Production
- Marketing & BD
- R&D
- **Fabric waste collection, segregation, processing**
- **Collaboration**
- **Co-Creation**
- **Recycling Fabric Waste**

Key resources
What resources do you need to make your idea work?

- Raw Material
- 2 production units
- Skilled Operators
- Certifications
- Supply Chain

- **Fabric Waste**
- **Existing buyers**

Key propositions
How will you make your customers' life happier?

- empower customer to secure life
- delivering high quality & Innovative Fire protection solutions
- Pioneers in the Industry of FR, India

- **Protecting environment and people**

Customer relationships
How often will you interact with your customers?

- 24x7 Customer support
- Constant Communication for ongoing orders

- **Daily updates on Social media**
- **Sustainability Updates**
- **Feedback Loops**

Channels
How are you going to reach your customers?

- Social Media
- Websites
- Blogs

- **Newsletters**
- **Pick ups for used garments**

Customer segments
Who are your customers? Describe your target audience in a couple of words.

- ONGC, SAIL
- Oil & Gas
- Vedanta
- Fire Fighting
- Bharat Petroleum, India Oil
- Chindi

- **Car Seat Fillers**
- **Electrical Cords**
- **Insulation manufacturers in construction**
- **Yarn and Thread Making.**
- **FR paper**

Cost Structure
How much are you planning to spend on the product development and marketing for a certain period?

- Importing FR Fabrics from China
- Compliances & Certification
- R&D

- **Legal**
- **Management / Maintenance**
- **Recall**

Revenue Streams
How much are you planning to earn in a certain period? Compare your costs and revenues.

- Order Based
- TaraArch
- **Complimentary Assets- existing buyers to send used garments- raw material**
- **Consultancy- Help with certifications**
- **Subscription Based Model**

We Protect.
We care.

References

https://tyndaleusa.com/blog/2018/03/21/nfpa-70e-2018-whats-new/
https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70E
https://www.westex.com/understand-the-hazards/flash-fire-protection/nfpa-2112/
https://www.westex.com/fr-fabric-brands/
https://www.westex.com/understand-the-hazards/flash-fire-protection/nfpa-2112/
https://www.ecmag.com/section/safety/very-short-guide-nfpa-70e
https://www.prnewswire.com/news-releases/flame-retardant-apparel-market-size-worth-5-11-billion-by-2027--cagr-6-7-polaris-market-research-301212413.html
http://ul.com/
https://www.osha.gov/dts/otpca/nrtl/
https://en.wikipedia.org/wiki/Northbrook,_Illinois
https://en.wikipedia.org/wiki/National_Board_of_Fire_Underwriters
https://en.wikipedia.org/wiki/Occupational_Safety_and_Health_Administration
http://ec.europa.eu/enterprise/policies/single-market-goods/cemarking/about-ce-marking/index_en.htm
https://www.investopedia.com/terms/q/quality-management.asp
https://www.investopedia.com/terms/i/international-organization-for-standardization-iso.asp
https://textilevaluechain.in/news-insights/flame-retardant-apparel-market-size-worth-5-11-billion-by-2027-cagr-6-7/
https://www.prnewswire.com/news-releases/flame-retardant-apparel-market-size-worth-5-11-billion-by-2027--cagr-6-7-polaris-market-research-301212413.html
https://linfordco.com/blog/what-is-iso-9000/
https://www.newindianexpress.com/business/2020/dec/30/special-rs-10000-crore-package-planned-for-ailing-textile-sector-2243007.html
https://www.ukessays.com/essays/management/in-analyzing-the-macro-environment.php
https://garmentsmerchandising.com/woven-fabric-defects-pictures/
https://sundastudio.medium.com/sustainability-in-fashion-the-top-5-manufacturing-certifications-a81dc0f014ee
https://fashionunited.com/i/sustainability-certification-organizations-in-fashion/
https://www.apparelentrepreneurship.com/your-guide-to-sustainability/
https://www.textiletoday.com.bd/green-green-factories/
https://think.design/services/user-research-company/
https://bioresources.cnr.ncsu.edu/resources/an-alternative-for-the-end-of-life-phase-of-flame-retardant-textile-products-degradation-of-flame-retardant-and-preliminary-settings-of-energy-valorization-by-gasification/
https://risnews.com/new-fire-resistant-fabric-made-recycled-fabric-waste
https://cris.vtt.fi/en/publications/fire-retardant-wood-polymer-and-textile-materials
https://www.omicsonline.org/open-access/waste-management-technologies-in-textile-industry-2576-1463-1000211-103175.html

Bibliography

Bhattacharjee, A. (n.d.). Waste Management in Textile Industry.

Dash, S., Kumari, S., & Bajpai, J. D. (n.d.). Barriers and Challenges for Green Garment Factory: India. International Journal of Latest Technology in Engineering, Management & Applied Science, 7(5).

GRIHA. (2010). Introduction to National Rating System - GRIHA An evaluation tool to help design, build, operate, and maintain a resource-efficient built environment. Ministry of New and Renewable Energy, Government of India, and The Energy and Resources Institute, 2010.

Sachidhanandham, A. (n.d.). Waste Management Technologies in Textile Industry. https://www.researchgate.net/publication/328142538_Waste_Management_Technologies_in_Textile_Industry

Topaloglu, F., & Er, O. (n.d.). Discussing a New Direction for Design Management through a New Design Management Audit Framework. The Design Journal, 20.

Yasin, S., Behary, N., Curti, M., & Rovero, G. (2016, May 11). Global Consumption of Flame Retardants and Related Environmental Concerns: A Study on Possible Mechanical Recycling of Flame Retardant Textiles. Fibers.

Yasin, S., & Sun, D. (2019). CRITICAL REVIEW ON THE WASTE-TO-ENERGY TECHNIQUES FOR FLAME RETARDANT TREATED TEXTILES.

https://www.researchgate.net/publication/332547602_CRITICAL_REVIEW_ON_THE_WASTE-TO-ENERGY_TECHNIQUES_FOR_FLAME_RETARDANT_TREATED_TEXTILES