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MEE3501 - PRODUCT

PRODUCT DEVELOPMENT AND MANAGEMENT

J Component Project Report

Topic-Ergonomic Folding Chair-Fl.eX

by

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Semester: FS 2022-23

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Acknowledgement

We would like to express our sincere gratitude to our esteemed guide (Prof Raja Shekar Y) for his continuous support towards the completion of this wonderful project titled “Ergonomic Folding Chair-Fl.eX”. We are also grateful to be a part of the Vellore Institute of Technology for its extraordinary curriculum and management. Moreover, the corrections from the expert project reviewers have added value to our work.

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TOPIC

Designing of an inexpensive, minimally-assembled, Ergonomic Folding Chair

Abstract -

People are well versed with the plastic - unattractive chairs found in every household and festive event. Though they have served their purpose for very long time, it is time to change the approach on how we rest ourselves.

Modern life is fast-paced which leads to little-to-no time for rest, therefore the time we take a break should serve its purpose successfully. But the generic plastic chairs, commercially used almost everywhere fails in satisfying that need. The ultra-mobile life of youth is the reference for the design and ergonomics of the product. It is designed to serve its purpose of delivering the pause every diligent being needs and with aesthetic design. The product is not just comfortable but easy to use, such that even kids can have its access. And most importantly its very affordable.

The product is ultra-portable unlike the majority of products in the current market. This serves to the wanderlust of the adventurer beings. And the distinctive feature of the product is its multiple copy synergy with itself, letting it create a larger bench if needed.

Objective -

The objective of the product is to change the way a being rests as affordable as possible. The quality of rest relies on the time spent resting and the ergonomics of the product. the staggering dimensions therefore turn the product highly mobile and accessible whenever needed.

It's not just operation but the product itself is very easy to handle. With a straightforward mechanism the product serves its purpose of being user-friendly and reliable in every challenging situation.

The feature that separates the product from the generally accessible product is its multiple-copy synergy. This refers to its ability to metamorphosize itself when adjoint to another product of its kind to turn it into a bench for a greater magnitude of space.

Though well-functioning, no aesthetics were left behind, themes like home, work, adventure, casual, etc., are kept in mind for the product to match its environment. Future variants of design will include more themes. User customization will also be available where the customer can choose the color palette of the chair.

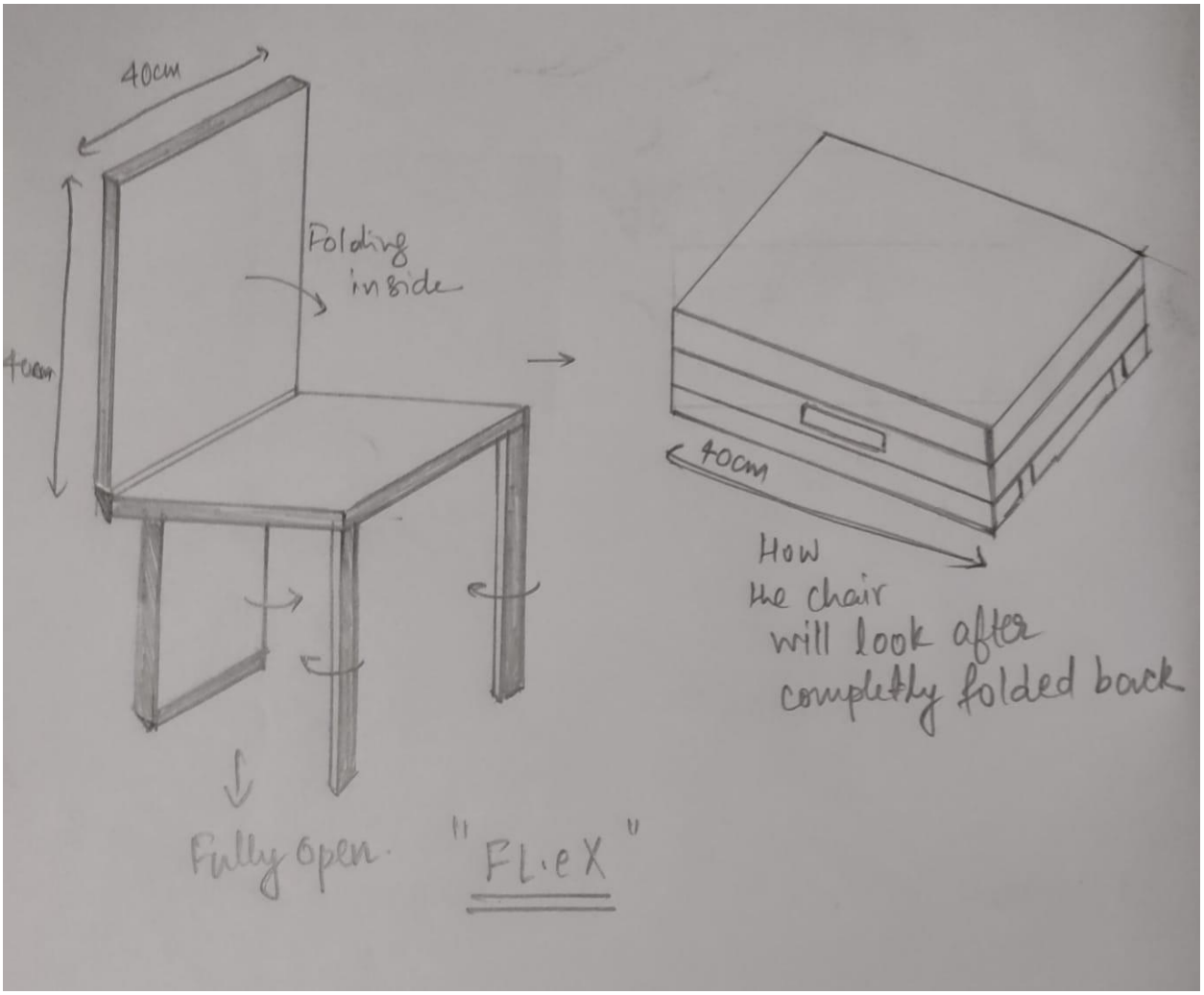
Motivation -

The average burden on an individual doing job or student is growing day by day in today's hectic and competitive society. It is challenging to maintain one's physiological health while still surviving in this competitive society. To maintain a critical balance between employment and a healthy work environment, health-specific designs must be included in daily living.

One approach to do this is to employ ergonomically designed furniture instead of traditional furniture designs. The primary goal of this project is to make any official or academic work environment more comfortable for lengthy periods. The first step is to redesign the most fundamental piece of furniture, the chair. A working professional or student spends most of his or her workday sitting. One of the most common causes of work-related injuries and strains is poor posture.

These chairs are designed to be utilized in a variety of settings and have a variety of usage possibilities. The design we will use for this product will not only assist in good posture but will also take up less space than

regular seats.



Background -

The background of the product is mostly based on the working class.

Some Top Chair Manufacturing Companies:

1. ***KEEKEA*** is one of the top companies that offer foldable chairs at relatively lower wholesale prices. They offer a wide range of metal, wooden, and plastic foldable chairs. One of the major advantages of this company is that it allows customers to customize their own products, like colour choice, fabric choice, and material choice.

Features:

a. Space-saving design
b. Stable structure
c. Superior stability performance

Production:

Metal chairs are manufactured by accurate laser cutting technology to get a good surface finish, and the metals that are used have excellent stability. The company manufactures strong, durable foldable plastic chairs using injection molding.

2. **SPEC SEATS** is another company that manufactures portable seating systems that are flexible, durable and comfortable.

   They are famous for manufacturing tall portable chairs that are designed to improve sightlines for the audience in locations throughout the venue. These types of chairs are designed to be used in stadiums, large halls, auditoriums and for large gatherings for some events such as dance shows, concerts etc.

   They maintain high standards by delivering quality materials and combining quality workmanship with innovative design.

3. **ERGO SEATINGS** produces quality chairs that are manufactured by quality manufacturers and all chairs that are produced have passed the BIFMA test and have quality assurance.

   It offers a unique design and each category of chairs has its own features and focuses on a specific area like some chairs are designed for lower back pain issues etc. The chairs are customized according to the needs of the customer and are highly adjustable.

Literature Review -

1) *Design selection criteria for foldable chairs,*
   Mohd Azman Abdullah, Shamsul Anuar Shamsudin, Shafizal Mat, Mohd Hanif Harun, Muhd Ridzuan Mansor, Faiz Redza Ramli, Fathiah Mohamed Jamil

   Many consumers now choose to buy foldable furniture to meet their household needs due to urban inhabitants' limited space. Folding chairs are among the many styles and concepts of foldable

furniture that have been released on the market. This research develops a strategy for choosing a foldable chair design.

A few factors are considered, including the intricacy of the folding mechanism, the structure's strength, the material choice, the kind of joint, the amount of time needed to build the chair, and its total cost. A weighted decision matrix is utilized to rank the best foldable chair design on the constrained wall of a hospital corridor based on these parameters.

In order to maximize space efficiency, it is sometimes preferable to design seating so that it may be folded away when not in use. Although they are often used, standard foldable chairs are portable, so they may be taken from the site where they are needed or even stolen. The ultimate goal of the foldable chair design is met when the chairs can be folded and the envelope size is greatly decreased.

2) *Study on Creative Design of Bamboo Furniture from the Perspective of Ecological Design, Weixia Gao*

Ecological design is a complete design methodology based on economic, ecological, and social multiparty criteria that adapts the design of products and services to the idea of population growth, economic and social resource use, and environmental sustainability.
Since ancient times, humans have preferred bamboo as an eco-friendly material. In general, the field of bamboo furniture design today lacks an awareness of ecological and sustainable design, which also persists in the direct use of conventional bamboo and has not yet been covered in other areas.

This article examines bamboo furniture's inventive design and marketing approach from an ecological design standpoint. It begins by outlining the history and philosophy of bamboo furniture ecological design. Second, it examines the material, technique, and cultural elements of the ecological design of bamboo furniture. Finally, it looks at practical product life cycle theory-based ecological design techniques for bamboo furniture. It is anticipated to develop a novel concept for bamboo furniture.

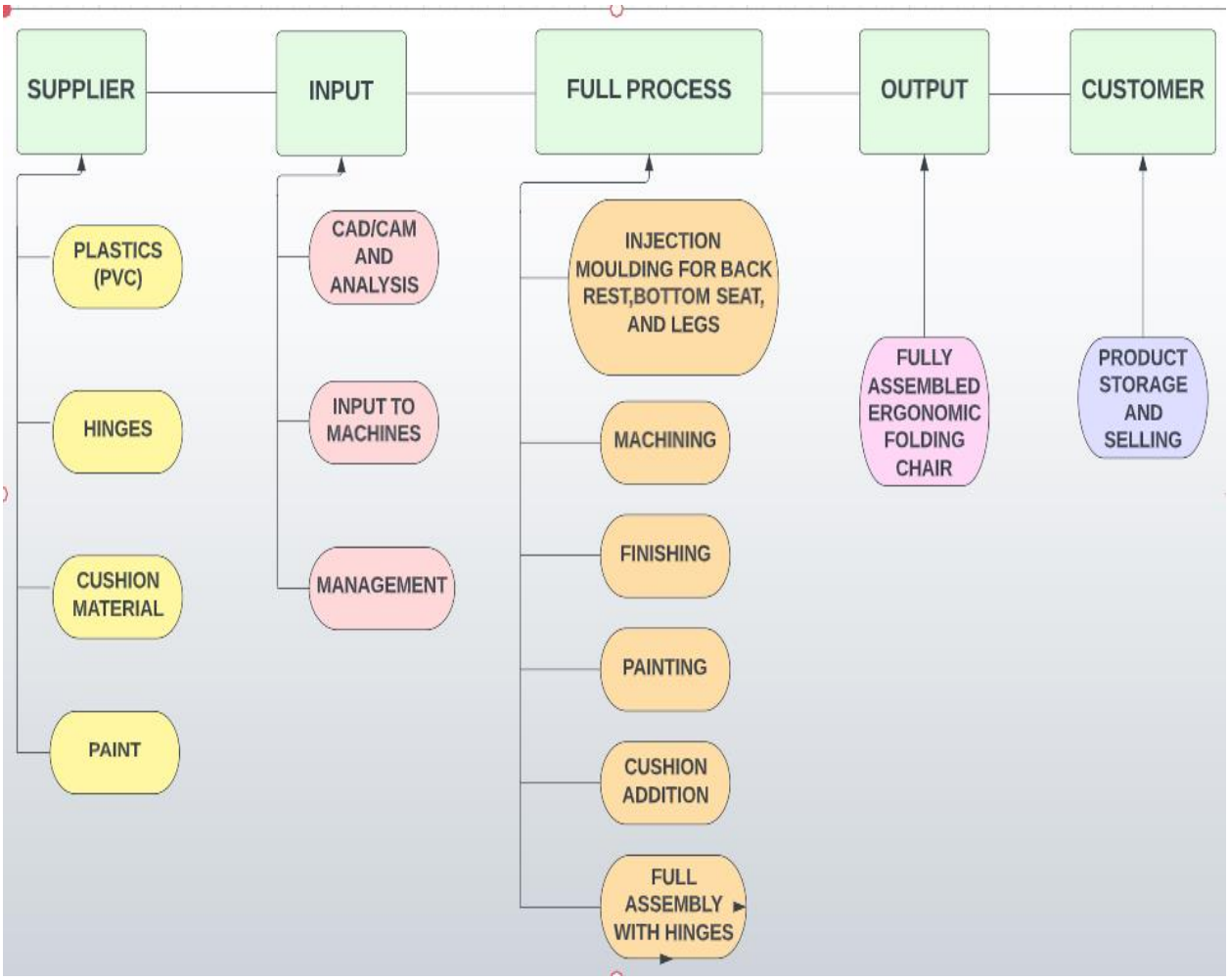
3) *Study on Low-carbon Corrugated Chair Design,*
Gui-ming Huang , Lingling Liu

Paper furniture has emerged as a new furniture material due to its ability to preserve the environment, be cost-effective, and have a variety of new uses. Contrary to wood, plastic, or metal, corrugated paper is simpler to mold by hand. Corrugated paper is processed by cutting, bending, and inserting pieces that are then assembled in a three-dimensional manner for load-bearing purposes. It does, however, inevitably have certain restrictions.
Through experience, corrugated paper becomes brittle in the horizontal direction. Concrete distribution should be done along the vertical axis of the stress.

To fulfil the demand for 100% recyclable products, a novel approach using corrugated chairs was suggested. A design plan was suggested using the low-carbon theory after analyzing the material and user requirements. Less components and simple assembly are two major components of the suggested design.

To investigate suitable morphology and structure, four design rules—abstraction and simplification, single design and community combination, simulation of irregular items, dimension transuding—were implemented as key laws in industrial design. The design schemes were to be evaluated from six perspectives: appealing appearances, assembly processing, material savings, correct ergonomics, poly-functionality, and totally collapsibility for simple storage. Experimental findings support the validity and viability of the systems, according to the stress test.

Process plan for the manufacturing of the product -



List of machinery, tools and equipment for manufacturing of the product -

Machine-

- Injection molding machine
- Machining CNC or manual - for finishing
- Automated machines for lifting and removal of parts

Tools and equipment-

- Wrap instruction
- Stapler
- Handle arm
- Wires

- Tapping screw
- Air gun
- Torque wrench
- Bolts
- Scissors
- Adhesive
- Trolley
- And all other small tools available in a manufacturing plant.

Raw materials -

Body-

The body of the chair can be manufactured using plastics.

Plastic used: Polypropylene (thermoplastic polymer)

Melting point: 160 degrees Celsius

It will not wear away over time and you can count on it year after year.

It does not rust or reacts with any acids, organic compounds etc.

It is derived from petroleum and is considered safe by EPA (Environmental Protection Agency).

It does not cause cancer in humans.

It is the most commonly used thermoplastics in the world.

Hinges -

Hinges need to be able to withstand a lot of stress of consistent opening and closing.

Due to this reason, stainless steel can be used to bear the stress and prevent rust and corrosion while it does not respond to the application of finishes.

Brass and Bronze both copper-based alloys are durable metals which can withstand extreme weather conditions.

Brass requires surface treatment to withstand corrosion against salt water while bronze is readily weatherproof and suitable for marine applications.

If weather resistance is not crucial to the design of the hinge coated steel is a cheaper alternative compared to brass.

Cushion -

Foam is the most popular material for cushions. It is soft, lightweight and easy to clean. Things like polyester and nylon are widely used in the manufacture of cushion covers.

POs coated polyester fabric alternative.

Polyolefins (POs) are a class of chemicals that offer an environmentally friendly alternative to polyvinyl chloride (PVC), and don't need plasticizer chemicals for flexibility.

A more comfortable chair cushion has a breathable fabric cover like cotton or wool.

Dealers: Sheela Foam Ltd. (Largest Foam manufacturer in the Asia Pacific)

1. Kurlon
2. Repose

Coating -

Premium Decor Satin Finish Enamel spray paint is best suited for plastic chairs.

It protects the chairs from scratches, chips and fading. This paint is resistant to weathering and corrosion.

Dealers: Sheenlac paints

Dulux, Nippon, and Asian paints are other products that can also be used

Market position -

India is a place for unique and excellent creative work in furniture. The Indian furniture industry is popular in the nation and internationally because of its rich handicrafts and attractive traditional art and design.

The Indian furniture market was valued at US 17.77 billion in 2020 and will rise to USD 37.72 billion by the end of 2026, growing at a double-digit CAGR of 13.37% during 2020-2026.

These days, customers also have the convenience of ordering furniture both online and offline - and the increase in digitization and flexibility of home delivery with customization options is surging the online Indian furniture market. Companies like Pepper Fry, Urban Ladder, and others are generating significant revenue through online platforms.

Factors driving the Indian furniture market are growing disposable income with an increase in the economy; expansion of the real estate and housing sector; and rising growth in the information technology and services sectors.

Besides, other contributing factors are the remarkable growth of the mass media, which has resulted in millions of middle-class Indians aiming for improved lifestyles and increasing demand for stylish homes in compact apartments.

Pricing Method -

While considering pricing methods for selling a furniture item like a chair we should consider a few things: The material the chair is made up of, the build quality of the chair, longevity, transport and logistics. We also consider the fact that since the target audience includes wedding arenas, our product would be sold in bulk quantity mostly. Before we set the price, we will do our market research to know the market price and we will try to sell at a much lower rate. We will also calculate COGM (Cost of Goods Manufactured) were -**Total Material Cost + Total Labor Cost + Additional Costs and Overhead = Cost of Goods Manufactured.**

Hence for wholesale selling, we would choose Cost plus pricing where the cost of production incurred plus the percentage of profit gives the total price along with the influence of market pricing. This will give the company a larger profit and a much more stable one compared to the rest.

Whereas for retailed selling we would choose Markup pricing where the percentage of markup is based on the selling point. Here the retail price is calculated as
-**Wholesale Price / (1 - Markup Percentage) = Retail Price**
We will research our market to see how other comparable brands or retailers set their prices. Then we can work backwards to see if the target retail price is feasible, based on the costs we incur to produce our products.

Design for manufacturing and assembly -

DFM AND DFA -

- From the above set of listed components, we have significantly reduced the numbers by integrating similar functioning parts.

- For example, the headrest as one module and adjustable connecting sections as another, thereby following a "modular approach".
- Since we focused more on adjustability factors for the product, it was necessary to include several mechanisms, which could be easily assembled (DFA)
- On the contrary, considering the DFM part, it could be pointed out that the various product components could be 3-D printed with PLA/nylon materials as they prove ideal at low temperatures, due to the presence of intricate patterns in our mechanisms. (Ease of fabrication)
- Since the headrest design is simple, the assembly process wouldn't prove hectic.
- Besides, it is the features that have complications in design as they are of advanced up-to-date technology.

Ergonomic standards -

The following analysis of the chair by well-established standards of client meeting chairs used in the offices as these types of chairs are considered to be the ideal chairs to use ergonomically. Though the chair in development can be used in various domains and scenarios, it is an objective to provide the best possible comfort for the product user.

The comparison is made under four major ergonomic standards concerning various components; therefore, the most relevant parameters are taken care of in this analysis. The standards under which the analysis is done are -

1. BIFMA G1-2013
2. CSA-7412
3. ANSI_HFES 100-2007
4. DOD-HDBK-743A

Out of these four standards, BIFMA G1-2013 is the most accurate representation of the general population's wants and needs therefore it is given greater importance for the standardization of the chair.

Chair - seat characteristics -

Parameters	Magnitude (in mm)
Length	460

Breadth	400
Seat height from ground	427
Cushion height	28

Chair - Backrest characteristics -

Parameters	Magnitude (in mm)
Height	450
Breadth	400
Thickness	15
Torse-Thigh Angle	5° (max)

Figure 3. Seat Height (vertical distance between floor and back of the knee)

Figure 4. Seat Depth (horizontal distance between the buttock and the back of the knee)

The Seat -

The most important parameters to be taken under consideration for the designing of the chair are proper seat height and seat depth. The height of a seat is determined by the distance between the floor and the back of the knee. Height plays a crucial role in reducing pressure on the soft tissues of the back of the thigh and hip bones. A proper height also promotes better blood flow and comfort to lower limbs.

Depth is considered to be the horizontal distance between the buttock and the back of the knee. Seat depth contributes to supporting the thighs and proper positioning of the user when the chair is under use. A space (usually 10 mm) is needed to be present behind the knees for the prevention of compression of unprotected vessels behind the knee.

Guideline dimensions according to different standards are given below.

Ergonomic Characteristic	Measurement Unit	Recommended Dimensions and Ranges*			
		BIFMA G1-2013	CSA-Z412	MIL-STD-1472F	ANSI_HFES 100-2007
Seat Height	Centimeters (cm)	37.6-51.2	**Low**: ≥38.0-≤45.0 **Standard**: ≥42.0 - ≤51.0	38-54 (increments of 3.0)	38-56 (adjustable over a min. range of 11.4)
	Inches (in)	14.8-20.2	**Low**: ≥15.2-≤18 **Standard**: ≥16.8 – ≤20.8	15-21 (increments of 1.0)	15-22 (adjustable over a min. range of 4.5)
Seat Depth	Centimeters (cm)	**Fixed**: Max. 41.5 **Adjustable**: should include a depth of 41.5 or less	**Shallow**: ≥38.0-≤42.0 **Medium**: ≥42.0 - ≤46.0 **Deep**: ≥ 46.0 **Adjustable**: at least 5cm including 42.0-46.0	≤40	**Fixed:** ≤ 43 **Adjustable:** include a depth of 43
	Inches (in)	**Fixed**: Max. 16.3 **Adjustable**: should include a depth of 16.3 or less	**Shallow**: ≥15.2-≤16.8 **Medium**: ≥16.8-≤18.4 **Deep**: ≥18.4	≤16	**Fixed:** ≤ 16.9 **Adjustable:** include a depth of 16.9
Seat Width	Centimeters (cm)	Min. 48.9**	≥ 45.0	38-46	Min. 45.0
	Inches (in)	Min. 19.2**	≥18.0	15-18	Min. 17.7
Seat Pan Angle	Degrees (°)	0°-4° rearward	Min. 3° forward and 4° rearward	0° - 7° rearward tilt	Min. range of 4°, including 3° in rearward position

* The standards in this table are appropriate for the 5% female to the 95% male stature

** Accommodates at least the 90% female and 97% male hip breadths

Comparing the values of guidelines dimensions it is observed that the dimensions mentioned for the product come under the recommended range for most of the standards taken into consideration.

The Backrest -

The backrest is the component that provides appropriate rest and comfort to the back and hip while maintaining a healthy posture for the user. The parameters that are considered to be the most important are height and width for providing proper support to the curvy nature of the spine. Under proper guideline dimensions, the risk of developing back pains and over-muscular activity of the back is reduced. It is observed that high backrests are more appropriate for reclining purposes which supports the upper back.

Figure 6. Example of a properly fitted lumbar support.

Figure 7. Example of an appropriate torso-to-thigh angle

The smaller width of backrests provides greater unrestricted movement but is not applicable for providing lower back support.

The guideline dimensions are given in the table below.

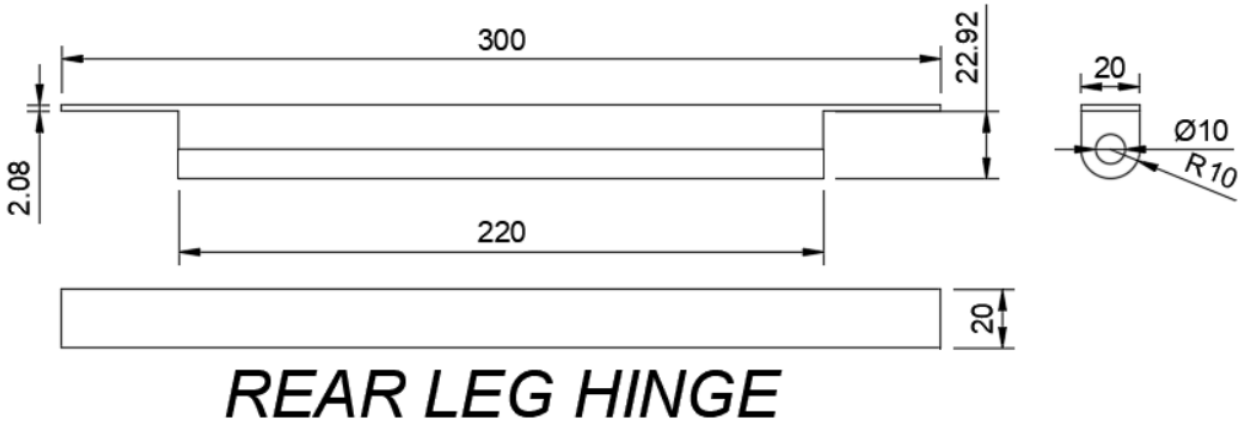
Ergonomic Characteristic	Measurement Unit	Recommended Dimensions and Ranges*			
		BIFMA G1-2013	CSA-Z412	MIL-STD-1472F	ANSI_HFES 100-2007
Backrest height	Centimeters (cm)	Min. 35.4 from compressed seat height	**Standard**: ≥45.0 - ≤55.0 from upper seat cushion **High Back**: ≥ 75.0	--	Min. 45 from compressed seat height
	Inches (in)	Min. 13.9 from compressed seat height	**Standard**: ≥18.0-≤22.0 from upper side of seat cushion **High Back**: ≥30 higher than standard back	--	Min. 17.7 from compressed seat height
Backrest width	Centimeters (cm)	Min. 36.0	≥35.0	30-36	Min. 36.0
	Inches (in)	Min. 14.2	≥14.0	12-14	Min. 14.2
Lumbar Support	Centimeters (cm)	15.0-25.0 from compressed seat height	**Fixed**:15.0-25.0 **Adjustable:** at least 5cm within 15.0-25.0	--	**Fixed:** 15.0-25.0 from compressed seat height **Adjustable**: be adjustable between 15.0-25.0
	Inches (in)	5.9-9.8 from compressed seat height	**Fixed**: 6.0-10.0 **Adjustable**: at least 2.5 within 6.0-10.0	--	**Fixed:** 5.9-9.8 from compressed seat height **Adjustable**: be adjustable between 5.9-9.8
Torso-Thigh Angle	Degrees (°)	**Fixed**: Min. 90° (vertical) **Adjustable:** range of ≥15° of which at least 15° falls between 90°-120°	**Fixed**: >93° - <103° **Adjustable**: 93°-113°	100°-115° recline	Adjustable: range of ≥15° of which at least 15° falls between 90°-120°

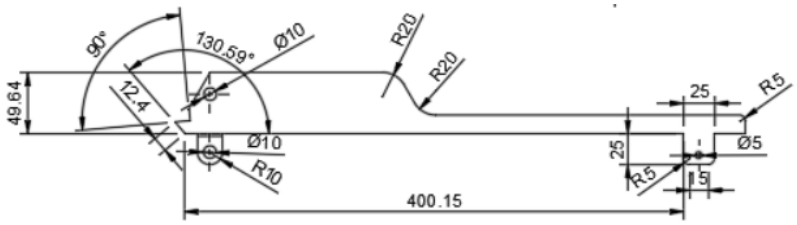
* The standards in this table are appropriate for the 5% female to the 95% male stature

Comparing the values of guideline dimension, it is observed that the dimensions mentioned for the product come under the recommended range for most of the standards taken into consideration.

Final Design -

Drawing with dimensions of each component -

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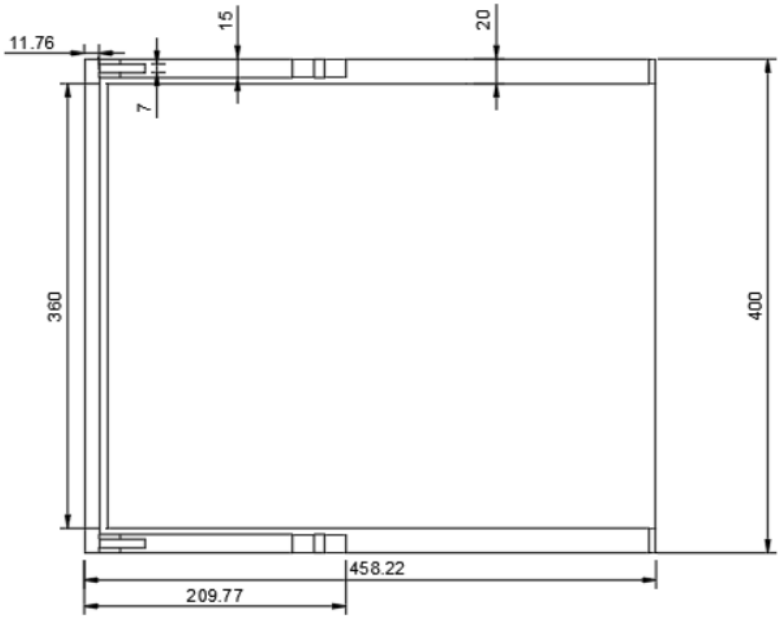
SEAT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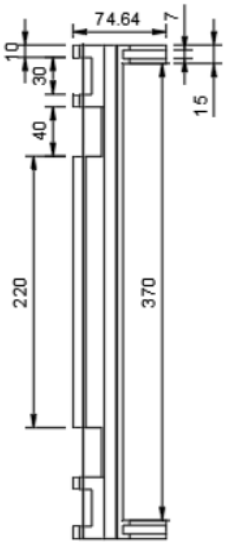
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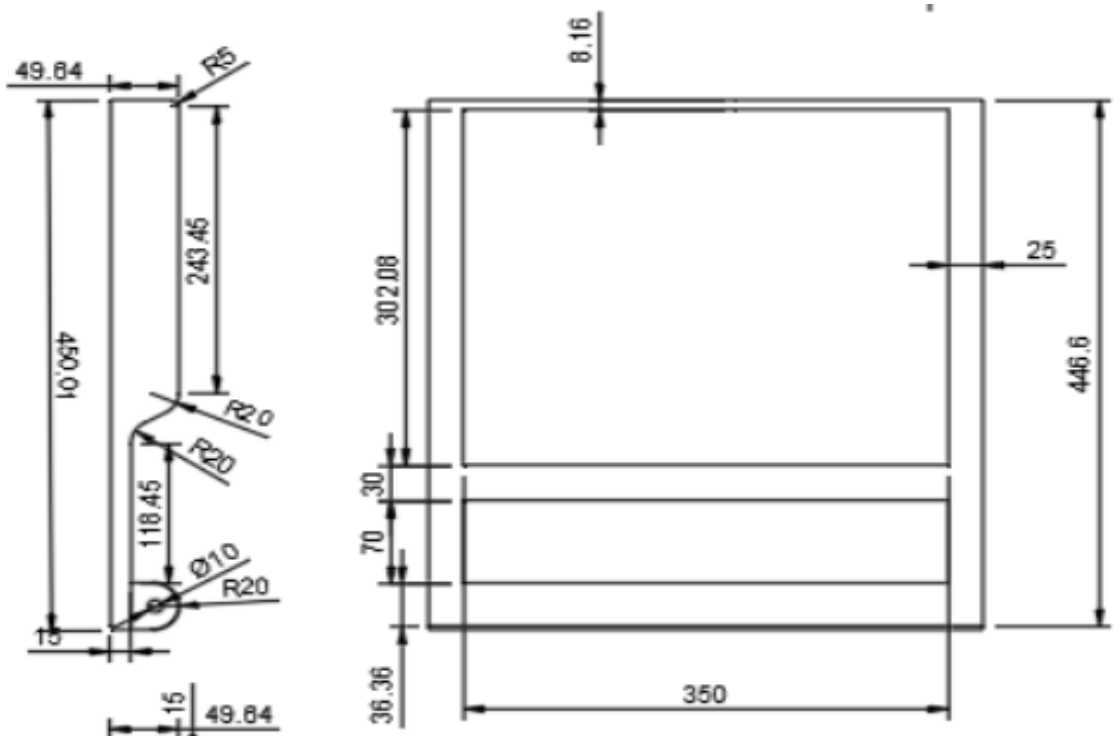
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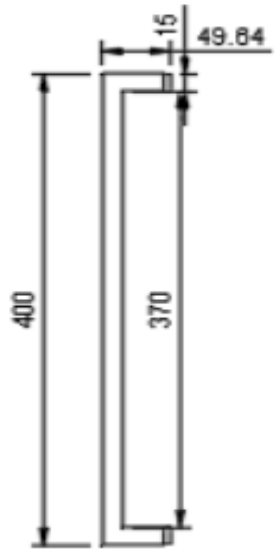
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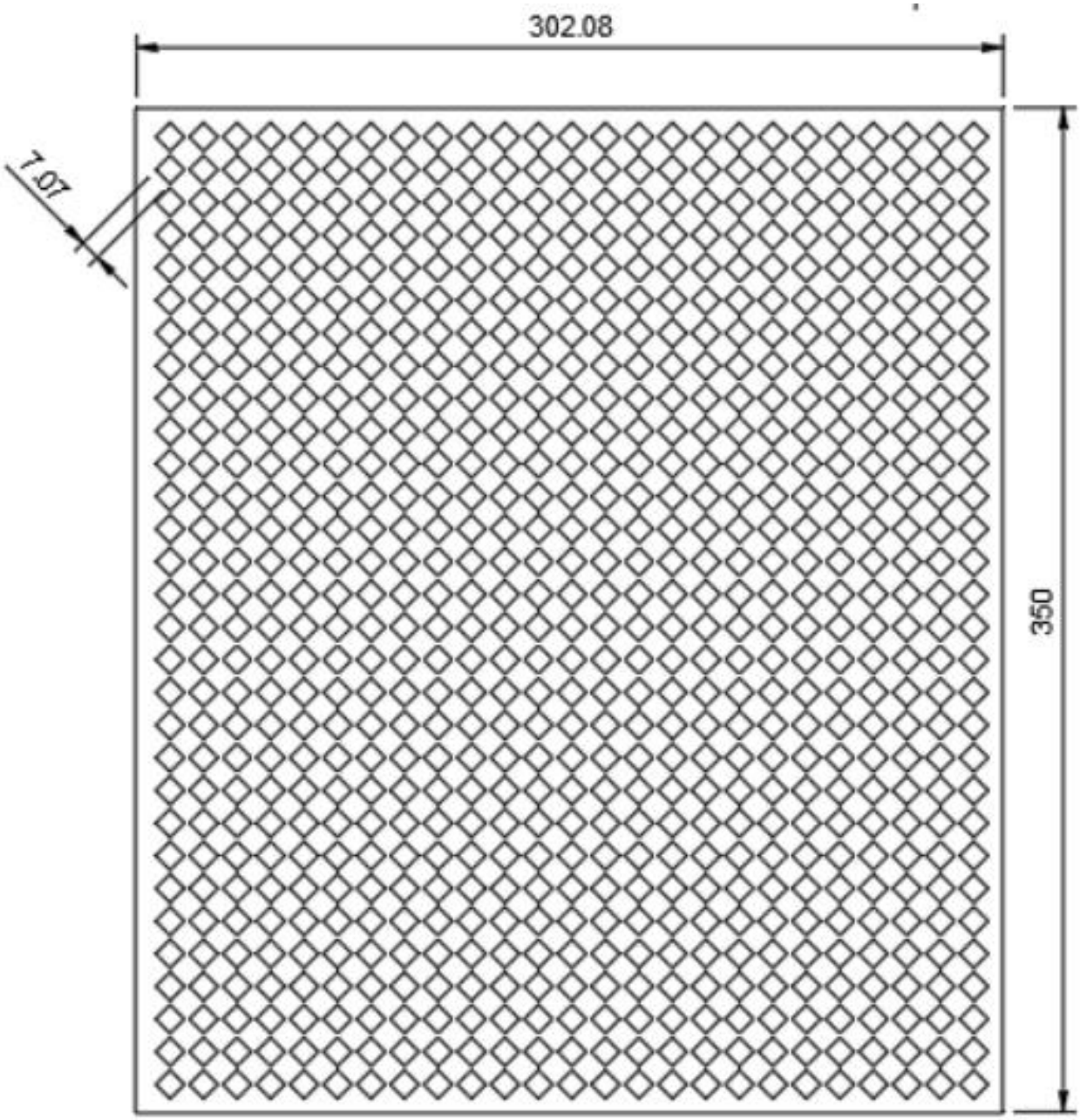
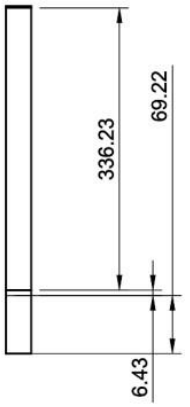


BACK REST STRETCHABLE MESH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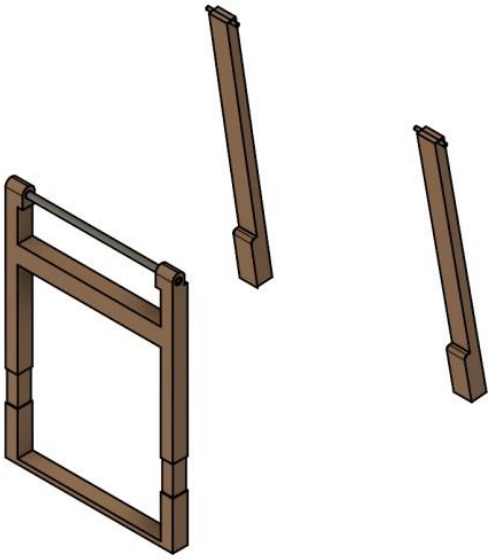

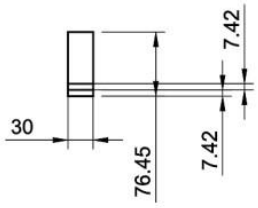
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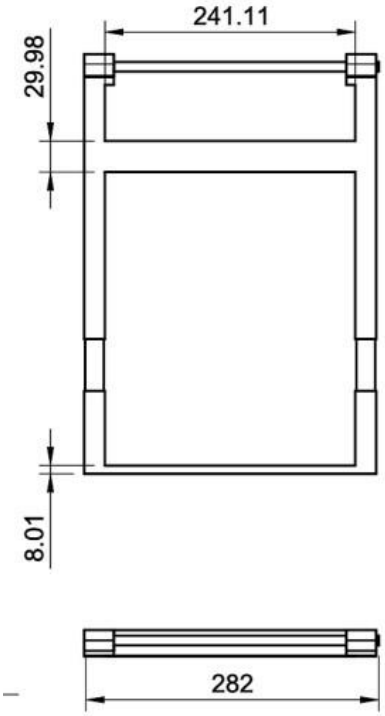
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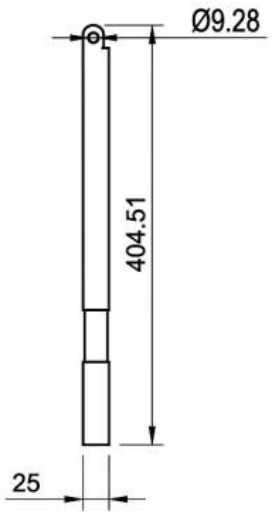
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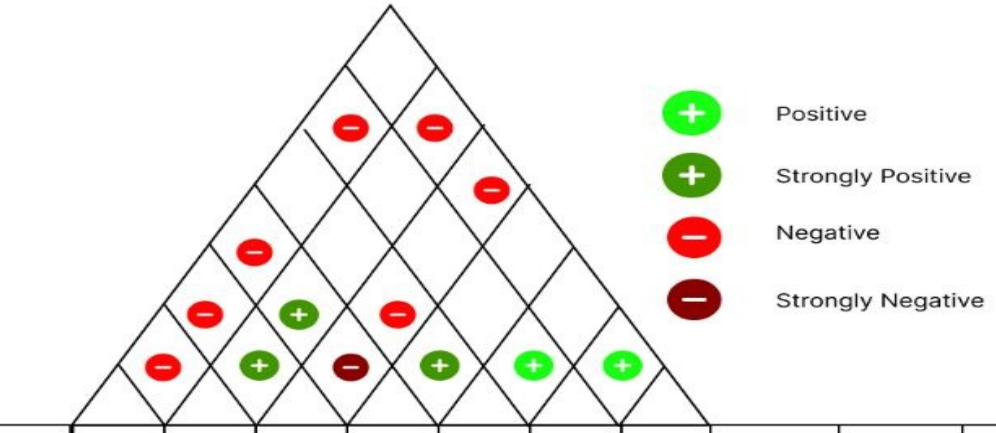
Discussions -

QFD Analysis -



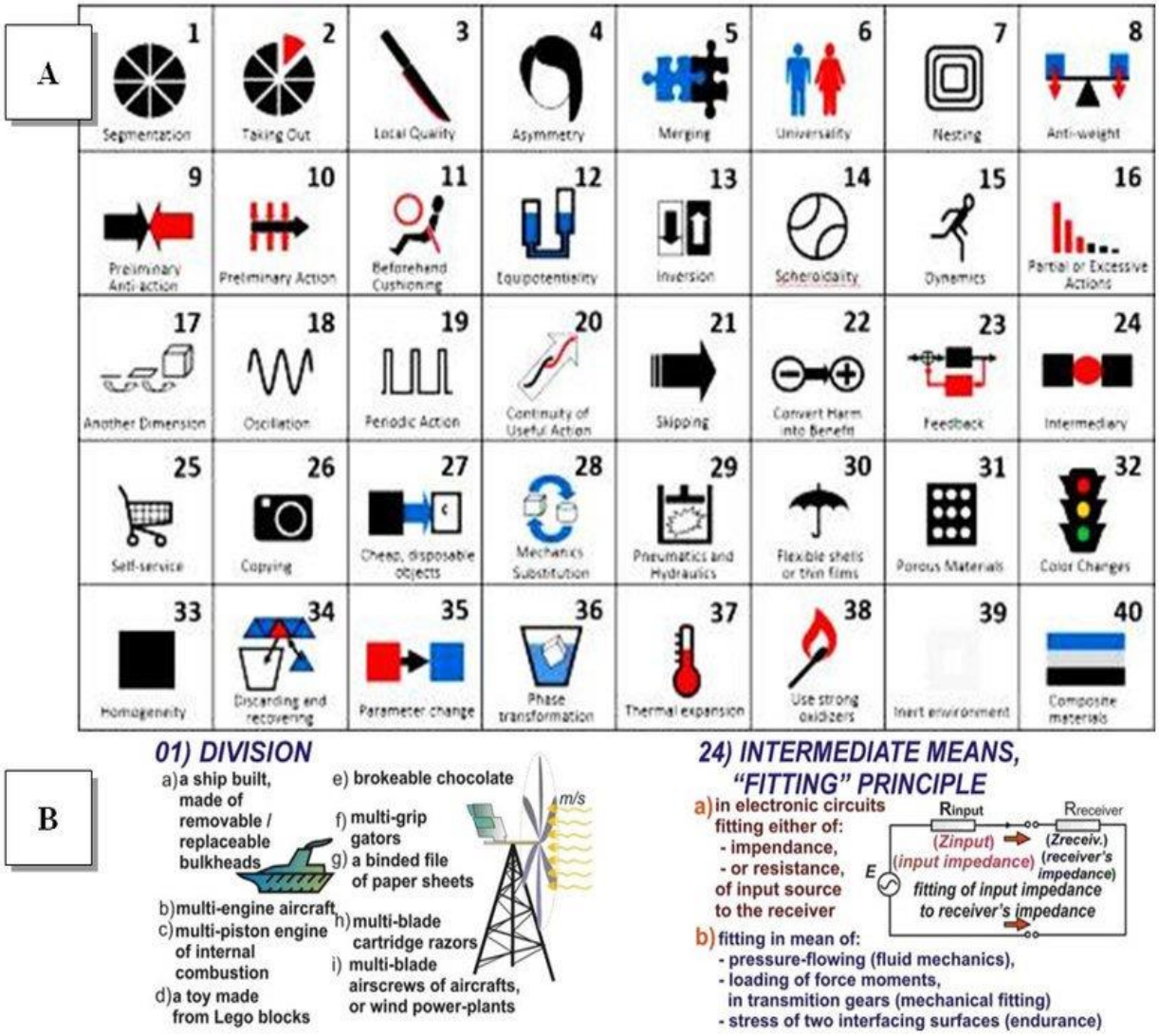
costumer Requirements	Relative importance weight	Weight %	Height	Weight	Cost of production	Material used	Strength	Dimensions	Cusion material	Fl.eX	KEEKEA	SPEC SEATS
Compact	4	14.28	9	0	3	0	1	9	0	5	4	4.5
Lightweight	3	10.71	3	9	1	9	1	3	0	3	3	3.5
Ergonomic	4	14.28	3	0	3	0	0	9	9	4	3	4
Safe	5	17.85	1	0	1	9	9	0	0	4	4	3
Features	3	10.71	0	3	9	0	0	9	1	3	5	4
Cheap	4	14.28	3	3	9	9	0	1	9	3.5	4	3
Durable	5	17.85	0	0	0	9	9	0	3	3.5	3	3
Importance			2.64	1.71	3.39	5.46	3.41	4.0	3.21			
Importance %			11.08	7.17	14.23	22.92	14.32	16.79	13.48			

FMEA -

System	FI.eX - Foldable Ergonomic chair	**Potential**	**FMEA Number**	PDM Project
Subsystem	NA	**Failure Mode and Effects Analysis**	**Prepared By**	Ishani Mishra, Prabuddha Kumar
Component	NA	**(Design FMEA)**	**FMEA Date**	12-11-2022
Design Lead	Anirrudha Jaiswal		**Revision Date**	16-11-2022
Core Team	Ishani Mishra, Prabuddha Kumar, Shriya Samal			

Item / Function	Potential Failure Mode (s)	Potential Effect(s) of Failure	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Prob	Current Design Controls	Det	RPN	Recommended Action(s)
Failure of Hinges	Corrosion	Screeching sound, clumsy movement of joints, potential detachment of component	7	Environmental factors.	6	Frequent lubrication, alloyed hinges, non-corrosive coating	8	**336**	Alloyed hinges, Non-corrosive coating.
	Over load	Fracturing of hinges	9	Human error	3	Clear specification of load limit.	10	**270**	More testing to figure out load limit of hinge.
	Vibrational loading	Loosening of screws	7	Human error, torque requirements overlooked.	3	Monitoring of torque treatment during assembly	7	**147**	Revisit contents of manual and assure all torque requirements are clearly communicated to the assembly operators and quality technicians using these documents.
Failure of structure	Over load	Fracturing of structure	9	Human error	2	Clear specification of load limit.	10	**180**	Revisit contents of manual and assure all requirements are clearly communicated to the customer.
	fatigue	Sudden fracture	9	Extensive use of the product over time	1	Fatigue test of the material and RnD on increasing its life.	10	**90**	Continue current pracices.
Tearing of backrest netting	Interaction with a sharp object in a direction perpendicular to net.	The net tears completely and its functionality ceases.	8	Human Error	1	Research on finding self reparing netting alternatives.	10	**80**	Continue current practices.
	fatigue	Customer's full expectations may not be realized.	3	Net starts tearing from the areas where it is attached to the chair.	1	Fatigue test of the material and RnD on increasing its life.	10	**30**	Continue current practices.

TRIZ -



Advantages if problem were solved:

- ***Comfortable seating experience***

  Our product and the features provide a comfortable yet luxury experience with its cushions which relaxes the body. It helps relieve some stress and discomfort. At an affordable cost a feeling of luxury is felt which is not only economical but also make the product a demand for our audience.

- ***Posture improvement***

  The main design aspect kept in mind is to keep the chair ergonomic meaning that it is good when viewed from health perspective. The ergonomic chair helps maintain the posture which in addition improves the overall productivity of the body.

- ***Durable***

  Durability is a major functionality of product. Our product compromises components that are not just durable but can also be maintained easily. This reduced maintenance cost and is value for money. All our additional features have good durability and are able to with stand high impacts and stress tests.

Definition of level excellence/desirability of product proposal -

- *Users of any age/height/specifications should be able to use the product without hassle.*
- *comfort at point of contact of users' body.*
- *Durability, exotic in looks and travel desired features incorporated.*

Problem solving studies -

- The product should be designed with less intricacy and minimum components, also considering ease of manufacturing.
- It is necessary to use simple mechanisms that users adapt to such as press/lock/ slotted fittings and large-coupled fasteners.
- Features discussed such as music/speaker systems, massagers, accessory holders and exotic mood lights.
- High quality foam and cotton to have low risk of skin weariness. Strong outer skeleton for protection against sudden movements.

Benchmarking -

A benchmark is a metric that is obtained via the benchmarking process. Benchmarks are the "what," while benchmarking is the "how," to put it simply. Benchmarking is not, however, a quick or straightforward process tool. Understanding the company's policies in-depth is essential before pursuing a benchmarking opportunity. Some businesses have rigorous policies about what information may be acquired and who practitioners might contact to obtain that information.

Since our product is innovative, we lack a benchmark; yet, we may compare all of its features to benchmarks.

1. ***Backrest -***

   Either a separate backrest or one attached to the seat is possible. We will try to make the backrest adjustable. Additionally, we can try to incorporate a change in its height and angle. The lower back's lumbar region is supported by the height adjustment. The optimal width for backrests is between 12 and 19 inches, and they should be shaped to accommodate your spine's curvature, particularly where it meets the lower spine. If the backrest and seat of the chair are one piece, the backrest should be movable in both forward and backward directions. Such chairs must include a locking mechanism on the backrest to keep it in place once you've found a comfortable position.

2. ***Seat pan characteristics -***

   Your spine naturally curves in the bottom portion. When sitting for long periods of time, especially with the proper support, this inward curvature tends to flatten and this delicate region is put under unnatural tension. On the seat pan, your weight must be dispersed equally. Be wary of rounded edges. For maximum comfort, the seat should also be at least an inch away from both sides of your hips. To accommodate variations in posture and relieve strain on your thighs, the seat pan should also tilt forward or backward.

3. ***Seat height -***

   A decent chair should include a pneumatic adjustment lever that makes adjusting the height simple. A decent chair should be 16 to 21 inches from the ground. The thighs may remain parallel to the floor at this height, and one’s feet can remain flat on the ground as well. People’s forearms can also be level with the work surface at this height.

4. ***Material used -***

   Strong, long-lasting materials should be used to make a decent chair. Additionally, the seat and back should have enough cushioning, particularly where the lower back contacts the chair. The greatest materials are those that can breathe and release heat and moisture.

5. ***Armrest -***

   Your lower back will feel less strain if you have armrests. Even better if they are height and breadth adjustable to assist various jobs like reading and writing. By doing so, you'll be able to reduce neck

and shoulder stiffness and avoid carpal tunnel syndrome. The armrest should be large, well padded, well-contoured, and of course, comfy.

6. ***Aesthetic appeal -***

   Sitting for long periods of time in routine, uninteresting office settings may be tedious, which can cause employees to lose interest in their jobs very early in a shift. A growing number of people are choosing ergonomic chairs because of their long list of health advantages and stylish, modern designs. Modern furnishings and neat workplace decor enhance the appearance and amaze your customers. It enhances the public perception of your business and contributes to the visual brand identity as a whole. Therefore, ergonomic chairs are the greatest alternative for you to modernize your workstation since they combine strength, adaptability, and style.

7. ***Adequate width and depth -***

   A chair that is too narrow for your hips or too deep for your behind will not give proper support. To select a deep enough chair, the person sitting in it should have their back against the seat and their knees 1-2 inches from the front of the seat, with at least two fingers between the back of your knee and the front of your seat. If you are quite tall, you should look for a seat with an adjustable depth setting so that your weight is distributed evenly between your buttocks and thighs. The seat should be retractable if you are really short so it doesn't press on the back of your knees.

8. ***Seat surface -***

   The seat surface should be soft and pleasant, often constructed of breathable materials that reduce the development of heat and moisture. Other materials could be better suitable in specific workplaces, such as hospitals or labs where there is a concern about infection control.

These are a few examples of the requirements we might establish for all of our supplementary features in an effort to meet our needs and raise the bar.

Conclusion -

Our idea solves these problems with a simple and a cost-effective solution. Our team plans to build an aftermarket portable chair. The Chair can be pulled out when needed. They are designed to be portable, easy to store and being very durable while maintaining it ergonomics. This product not only resolves the

issue of good seating experience and comfort but due to its additional features adds to the ambience and according to reports the comfort effect the mood of a person. The cushioning allows support and prevents spine and neck pain.

We have hereby designed a chair that can be used easily and solve problems. It can be used to replace the traditional functional and office chair while giving the same satisfaction.