THE GRADUATION PROJECT 2024

VALOR

A basketball shoe that prioritises player centric features for optimal performance on outdoor courts.

VOL. 1 of 1

Student : Siddhant Baveja

Sponsor : Nivia Sports

Mentor : Raj Menon

Consultant : Ashish Sharma

Programme :
Bachelor of Design (B.Des)
Industrial Design

JK LAKSHMIPAT UNIVERSITY
Institute of Design
NAAC 'A' Grade Accredited

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The Evaluation Jury has recommended **Siddhant Baveja**

for graduation from **Institute of Design, JK LAKSHMIPAT UNIVERSITY**

with specialization in **Product Design**

Herewith, for the project titled VALOR

on fulfillment of requirements by

Jury Chairman	Neeraj Kumar	Neeraj Kumar
Jury Member	Pritam Singh	Pritam Singh
Jury Member	Abhimanyu Nohwar	Abhimanyu.

Remarks, if any.

Well researched & presented. Thorough process. Fix the Making ~~Aesthetic~~ Lifestyle / Functional Performance

Good range of explorations. Excellent storytelling & presentation. Great passion. Well Done !!

Commendable work! Nice iterations & prototype fabrication. Well thought & thorough User testing is something you can work on.

Dean, Institute of Design
JK Lakshmipat University

Preface

Basketball is a game of passion, energy, and skill, where every movement matters. Whether it's a quick pivot to shake a defender or a powerful dunk that brings the crowd to its feet, the right footwear can make all the difference. That's why I was dedicated to create a basketball shoe that truly puts the player first. This project isn't just about designing another shoe—it's about listening to what basketball players really need and want, and making those insights the heart of my design.

I worked with athletes at all levels, learning from their experiences and understanding their challenges. By focusing on comfort, stability, injury prevention, and performance, I have designed a shoe that meets the real demands of the game. Every choice made, from the materials I used to the way the shoe supports the foot, is centered on enhancing the player's experience.

Acknowledgement

I want to take a moment to sincerely thank the amazing faculty at [Your College Name]. Your guidance and expertise in design have played a huge role in shaping my passion and understanding of the field. Your dedication to teaching and the support you've shown me throughout my studies has truly made a difference, and I'm incredibly grateful.

I also want to give a heartfelt shoutout to my friends. Your encouragement and the good times we've shared have kept me going, especially during the tougher moments of this project. Your support has been everything.

Lastly, I want to extend a big thank you to [Company Name]. Getting the chance to design shoes in a real-world environment has been an unforgettable experience. It's helped me grow so much as a designer. Thank you for trusting me with the opportunity and for giving me the space to bring my ideas to life.

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About JK Lakshmipat University

Founded in 2011, JK Lakshmipat University (JKLU) is an academic institution
known for intellectual honesty and commitment to excellence. Openness and trust form the epicentre of their ideology makes them the preferred choice for learning.

Their core and advanced study programmes in Engineering, Management, and Design remain student-centric to allow seamless progression to a skill-oriented future.



About My Mentor



Raj Gopal Menon

Raj Gopal Menon is an accomplished Industrial Designer with a Mechanical Engineering degree from Calicut University and a postgraduate degree in Industrial Design from IIT Mumbai.

With over 35 years of experience, he has designed a diverse range of products, from medical devices to consumer electronics and furniture. Raj's approach to design involves developing concepts, researching technologies, and bringing ideas to life as functional products.

About Me



I’m Sidhant Baveja

I am an Industrial Design student with a keen interest in Footwear and Lifestyle Products, a creative thinker who is passionate about problem-solving and making a positive impact. A go-getter who believes that "no failure is final and no success is permanent".

I am a kinesthetic learner who believes that empathy and research are essential to come up with good design and the ideal solution.

I thrive on exploring various materials through hands-on experimentation to create meaningful experiences.

About Nivia

NIVIA is a well known true Indian iconic sports brand in the sports industry involved in shaping sports in the country since 1930s. Known for its wide range of sports products including footwear, apparel, equipment, and accessories for various sports. It is an affordable and provides sports equipments for all pockets.

NIVIA is India's leading manufacturer of sports equipment with state-of-the art facilities. The brand emphasises affordability without compromising on quality, making its products accessible to a broad audience. Nivia has a strong distribution network, with its products available in retail stores, online platforms, and sports outlets across India and now internationally.

NIVIA sponsors various sports events and teams and is dedicated to supporting Indian athletes and sports enthusiasts, enhancing its brand visibility and association with sports. Its commitment to innovation and excellence has earned Nivia numerous accolades and a loyal customer base.

Nivia's Catalogue:



Nivia's Competitors:



Project Process

Understand the Problem

- Observe

Collecting facts about product

- Understand how the product works
- Understand how the product is made

Collecting facts about market

- Understanding the Market
- Understand the competition
- Finding existing products
- Trend analysis

Understanding player needs

- Understanding the consumer
- Understand What the player needs
- Understand why they need
- figuring how it can be done

Design Brief

- How I can solve the solution and what the solution is

Develop

- Ideation
- Prototyping

Deliver

- User Testing

Market research

Indoor / Outdoor:



Indoor / Outdoor:



Upper:



Artificial Leather + Mesh



TPU + Knit



Mesh + TPU



Artificial Leather + TPU



Artificial Leather + Knit

Artificial Leather

Knit

Mesh

TPU

Midsole:











Phylon

TPU

EVA

Rubber

Outsole:



Rubber

Herringbone

Radial

Pattern

Market Study Analysis

Trends

Minimal design
Solid/Dual/Triple tone colours
Pastel/Bright colours
Colour for highlight instead of print
Simple design
Layered components
Curved heel on midsole
Herringbone outsole pattern

Materials

Upper	Artificial Leather Knit Mesh TPU
Midsole	Phylon TPU EVA Rubber
Outsole	Rubber

User Study

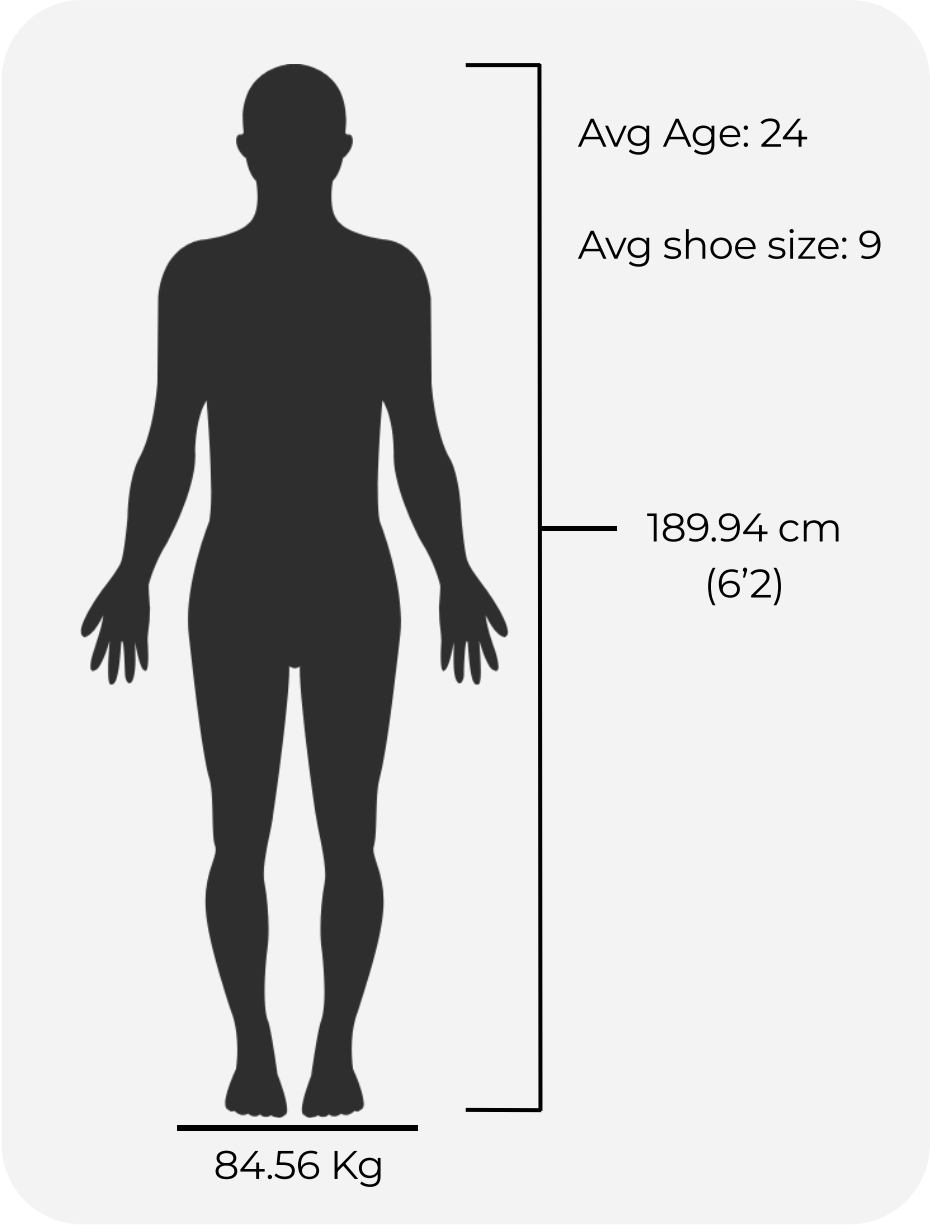
Number of Interviewees

118 individuals

Interviews were done by meeting players visiting academys and over phone calls

Interview Stakeholders

Players	72
Parents	7
Coachs	16
Referee	3
Sales executive	13
Dealers	5
Shop Owners	2



Questions asked

- About them (Demographics)
- How often do you play basketball?
- What level of basketball do you play (recreational, amateur, professional, etc.)?
- **What comes to your mind when you think of a basketball shoe?**
- Do you play on an Indoor court or an Outdoor court?
- Prefered price range for Basketball shoes?
- **Preference in brand and why?**
- **What factors make you approach a basketball shoe?**
- **How do you choose the Right shoe for yourself?**
- What are your current basketball shoes?
- How satisfied are you with your Basketball shoes, and why?
- What would be certain features you would want on your basketball shoe?
- **Please describe your version of a perfect basketball shoe?**



Insights



Player



Sales Executive



Player



Player



Player



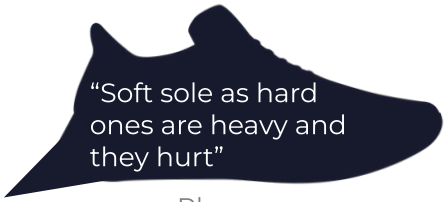
Player



Dealer



Dealer



Player



Parents



Coach



Coach



Coach



Coach



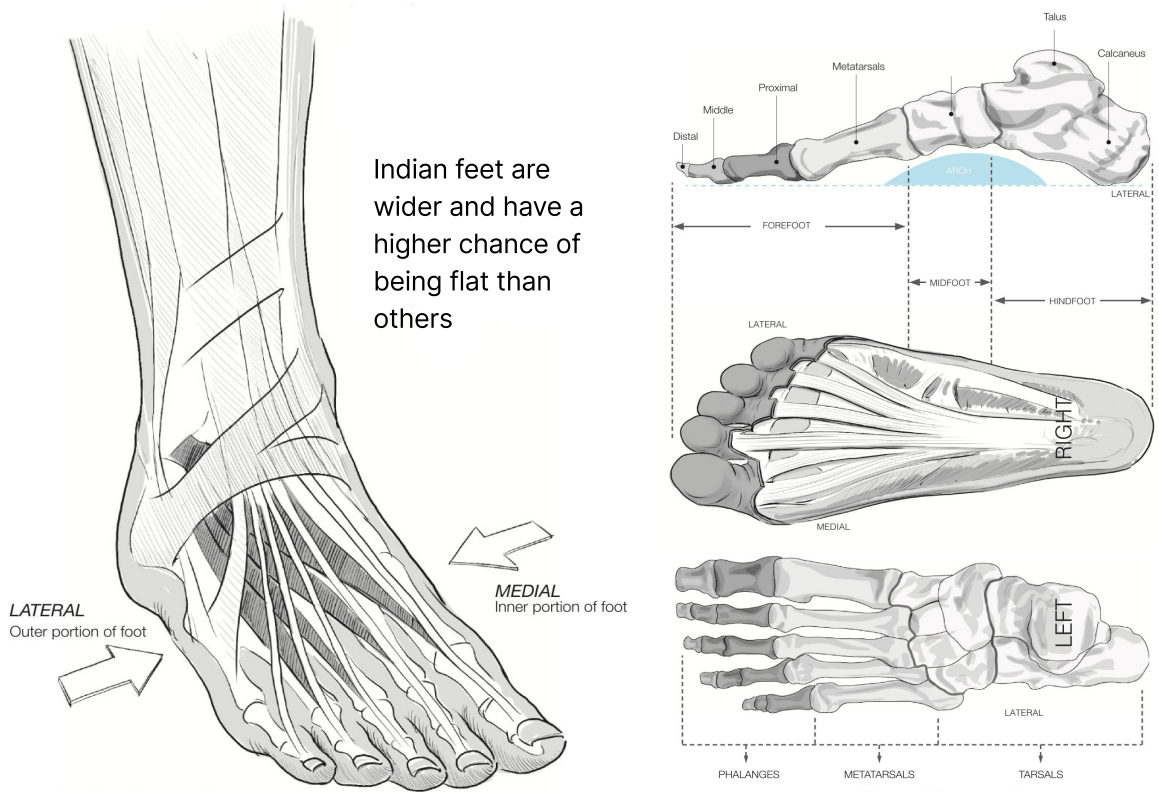
Player



Player

Literature Review

Anatomy of a foot



The anatomy of the foot is quite complex, comprising **26 bones, 33 joints, and over 100 muscles, tendons, and ligaments**, all working together to support movement and balance. The foot can be divided into three main sections: the forefoot, midfoot, and hindfoot. The forefoot includes the toes (phalanges) and the long bones (metatarsals), crucial for balance and propulsion. The midfoot consists of a pyramid-like collection of bones forming the arch, providing flexibility and shock absorption. The hindfoot contains the heel bone (calcaneus) and the ankle bone (talus), which connect the foot to the leg and bear the body's weight. This intricate structure allows the foot to perform a wide range of movements, from walking and running to jumping and balancing.

Basic Anatomy of a Shoe

1. Upper
2. Midsole
3. Outsole
4. Toe Box
5. Vamp
6. Eyestay
7. Tongue
8. Collar
9. Heel counter
10. Tape loop



Anatomy of Basketball Shoes

- **Upper:** This is the top part of the shoe that covers your foot. It can be made from materials such as synthetic leather and/or mesh. A synthetic upper may include features like overlays or perforations to provide breathability and support.
- **Tongue:** The tongue is a flap of material that sits between the laces and your foot. It helps to protect the top of your foot from pressure caused by the laces. It's often padded to provide a comfortable fit.
- **Laces:** Basketball shoes typically have laces that allow you to adjust the fit of the shoe. Some shoes may also have a laceless design or use alternative closure systems like straps or zippers.
- **Collar:** The collar is the part of the shoe that wraps around your ankle. It's often padded for extra comfort and support.
- **Midsole:** The midsole is the layer of material between the upper and the outsole. It provides shock absorption to cushion the impact on your feet and joints.
- **Outsole:** The outsole is the bottom part of the shoe that comes into contact with the court. It's usually made from rubber or a similar material that provides grip and traction.
- **Heel Counter:** This is a stiff piece of material that sits at the back of the shoe and helps to keep your heel in place. It provides structure and support, and helps create a "locked-in" feeling.
- **Toe Box:** The toe box is the front part of the shoe that covers your toes. It should be roomy enough to allow your toes to move comfortably, but not so loose that your foot slips around inside the shoe.
- **Insole:** The insole is the cushioned layer that sits inside the shoe under your foot. It can provide additional padding and arch support, and may be able to be replaced with custom insoles if needed.

Anatomy of Basketball Shoes

Basketball shoes are typically separated into three categories: the upper, midsole, and outsole.
Each component of the shoe has features that will impact its longevity and performance.

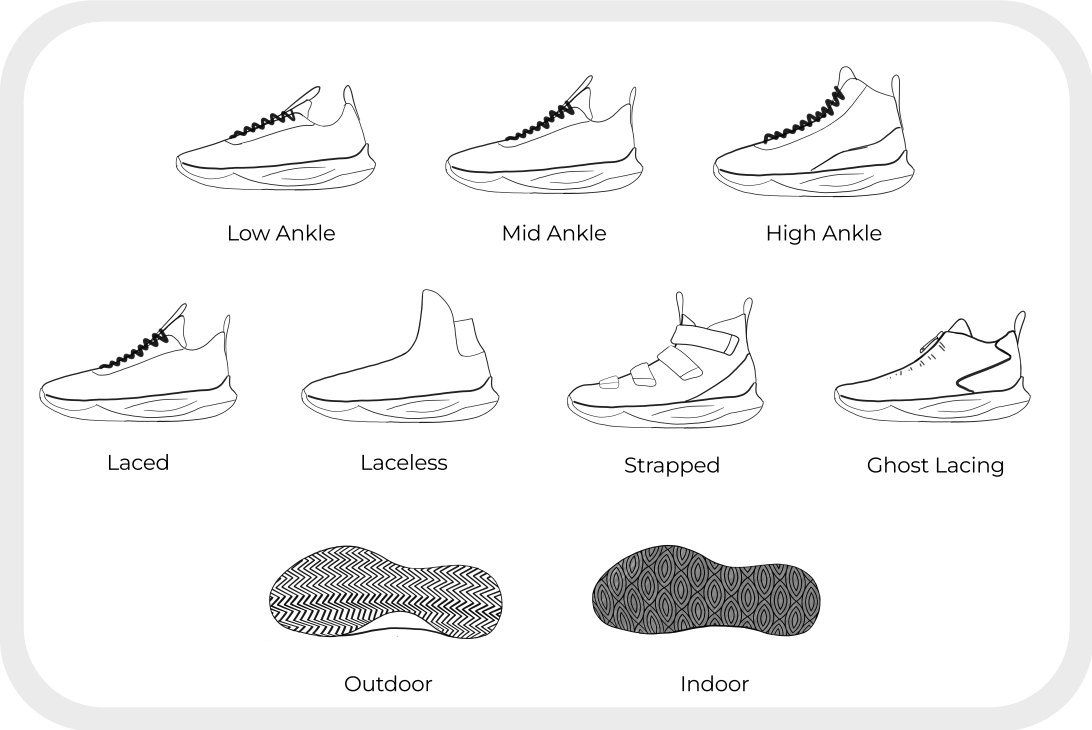
The Upper
When it comes to the upper part of basketball shoes, you must first select which height you want.
Basketball shoes come in three heights: high, mid, and low, and each appeals to a distinct kind of player.

- **High:** The upper wraps around your ankle for added support and stability. But an extra layer of protection often comes with extra weight
- **Mid:** these provide a pleasant midway between ankle support and flexibility. The upper is kept close to the ankle to give some protection without having an all-enclosing construction. Mid-tops allow for greater flexibility
- **Low:** these have little ankle support due to their lower profile and are designed for speed and agility

The Midsole
The midsole of a basketball shoe is where the cushioning will be found, and this makes this area one of the most essential components of a shoe's performance.
The majority of midsoles are made up of foams, which range from light to heavy and include EVA and compressed EVA foam.
In comparison, polyurethane midsoles are heavier and more durable.
The midsole can also include brand-specific cushioning materials in the heel and forefoot. This technique is used to provide extra cushioning in pressure zones that would be subjected to a lot of strain during the course of a match.

The Outsole
The outsole of a shoe is made of rubber or synthetic materials and provides your shoes traction.
When shopping for basketball shoes, look for a fairly flat and wide outsole to ensure you have the most balance.
Search for outsoles with a herringbone or hexagonal design to increase your traction. These are built to help keep your feet secure and prevent you from sliding up and down the court.

Types of basketball shoes



Popular basketball shoe brands

Types of basketball shoes:

- **High-Top Basketball Shoes:**
  - Purpose: High-top basketball shoes offer maximum ankle support and stability, making them suitable for players who prioritize injury prevention and support.
  - Features: These shoes typically have a higher cut that extends above the ankle, providing a secure fit and reducing the risk of ankle injuries.
  - Players: They are popular among big men and players who make frequent cuts and sharp movements.

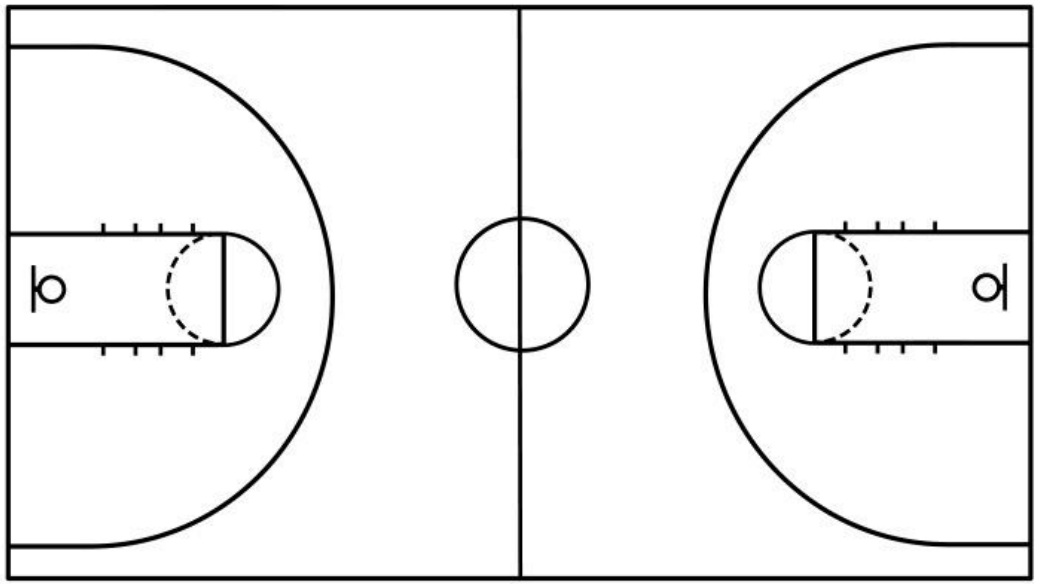
- **Mid-Top Basketball Shoes:**
  - Purpose: Mid-top basketball shoes provide a balance between ankle support and mobility, offering support while allowing for more freedom of movement compared to high-tops.
  - Features: These shoes have a mid-height cut that provides some ankle support without restricting agility.
  - Players: They are suitable for guards and forwards who prioritize agility and quick movements on the court.

- **Low-Top Basketball Shoes:**
  - Purpose: Low-top basketball shoes prioritize flexibility, lightweight design, and enhanced mobility, making them ideal for players who prioritize speed and agility.
  - Features: These shoes have a lower cut that does not extend above the ankle, allowing for unrestricted ankle movement.
  - Players: They are often preferred by point guards and players who rely on speed, quick cuts, and agility.

About Basketball

Basketball is a **fast-paced**, **team sport** that is played on a rectangular court by two teams of five players each. The objective of the game is to score points by shooting a ball through the opponent's basket.

Basketball is **officially the fastest-growing sport** in the world. Despite being slightly less popular than football, basketball is currently the second largest sport in the world after Football.



Indian Court surfaces

Asphalt outdoor:
It is a popular choice for outdoor courts, it is made by combining fine sand and oil

Indoor Hardwood court:
It is a popular choice for indoor courts and provides supirior playing experience.

Synthetic court:
Most versitile as it can be placed indoor or outdoor, it is commonly made of PVC or polypropylene



Basketball shoes are specifically designed for the dynamic movements and demands of basketball gameplay. They need to serve several primary functions to support players' performance and protect them from injuries:

Support: Basketball involves a lot of quick movements, jumps, and cuts. Therefore, basketball shoes need to provide adequate support to prevent ankle injuries and provide stability during these movements.

Cushioning: Impact absorption is crucial to protect players' feet and joints from the high-impact nature of the game. Basketball shoes should have cushioning technology in the midsole to absorb shock and reduce the risk of injuries such as stress fractures or shin splints.

Traction: Good traction is essential for maintaining grip on the court surface, allowing players to make quick cuts, stops, and changes in direction without slipping. The outsole pattern and materials play a significant role in providing optimal traction.

Durability: Basketball shoes need to withstand the wear and tear of intense gameplay. Durable materials and construction techniques are essential to ensure the shoes can last through multiple games and practices without falling apart.

Breathability: Basketball is a physically demanding sport that can cause feet to sweat. Breathable materials and ventilation features help to keep the feet cool and comfortable during gameplay, reducing the risk of blisters and discomfort.

Materials

Mesh

1. Composition:

Typically made with synthetic fibers like polyester or nylon.

2. Properties:

- Breathability: Highly breathable due to open weave structure.
- Lightweight: Minimal weight, enhancing comfort and ease of movement.
- Durability: Good resistance to wear and tear.
- Flexibility: Offers some stretch, conforming to body movements.

3. Applications:

Used in sportswear, shoes, backpacks, and outdoor gear for ventilation and comfort.

Knit

1. Composition:

It is made from various fibers, including cotton, wool, polyester, and blends.

2. Properties:

- Stretchability: Naturally stretchy, providing excellent comfort and fit.
- Breathability: Generally breathable, suitable for activewear.
- Warmth: Can offer good insulation depending on the fiber and knit pattern.
- Texture: Soft and comfortable against the skin.

3. Applications:

Widely used in apparel, including t-shirts, sweaters, sportswear, and socks.

Lycra

1. Composition:

A synthetic fiber known for its exceptional elasticity.

2. Properties:

- Stretchability: Can stretch up to five times its original length.
- Recovery: Returns to original shape after stretching.
- Durability: Resistant to abrasion and body oils.
- Lightweight: Adds minimal weight to fabrics.

3. Applications:

Commonly used in activewear, swimwear, underwear, and compression garments.

Materials

TPU (Thermoplastic Polyurethane)

1. Composition:

A version of polyurethane plastics with varied properties.

2. Properties:

- Elasticity: Flexible and can be molded into various shapes.
- Durability: High resistance to abrasion, impact, and weather conditions.
- Transparency: Can be made transparent or colored.
- Recyclability: More environmentally friendly than some other plastics.

3. Applications:

Used in footwear (especially soles), medical devices, automotive parts, and protective cases.

PU (Polyurethane)

1. Composition:

A polymer composed of organic units joined by carbamate links.

2. Properties:

- Versatility: Can be rigid or flexible depending on the formulation.
- Durability: High resistance to abrasion, chemicals, and environmental degradation.
- Waterproof: Can be made waterproof, making it suitable for various applications.
- Softness: Flexible PU can be very soft and comfortable.

3. Applications:

Used in synthetic leather, insulation, furniture padding, automotive parts, and coatings.

Comparison

Breathability:

- High: Mesh, Knit
- Medium: Lycra (depends on blend), TPU, PU

Stretchability:

- High: Lycra, Knit
- Medium: Mesh, TPU
- Low: PU (depends on formulation)

Durability:

- High: TPU, PU
- Medium: Lycra, Mesh
- Variable: Knit (depends on fiber and knit pattern)

Weight:

- Lightweight: Mesh, Lycra, Knit
- Medium: TPU, PU

Applications:

- Sportswear: Mesh, Knit, Lycra
- Footwear: TPU, PU, Mesh
- Protective Gear: TPU, PU
- Everyday Apparel: Knit, Lycra

Biomechanics

Biomechanics plays a crucial role in foot movement in basketball, as it directly impacts performance, agility, and injury prevention. Here are some key aspects of biomechanics in foot movement in basketball:

1. Foot Positioning:
   - Proper foot positioning is essential for balance, stability, and efficient movement on the court. Players have to distribute weight on their feet, adjust foot angles for cutting or pivoting, and maintain optimal stance for quick movements.
2. Planting and Push-Off:
   - Players plant their feet when stopping, changing direction, or accelerating. The timing and force of the push-off phase, which generates propulsion and speed during movements like sprinting or jumping.
3. Cutting and Lateral Movement:
   - Cutting and lateral movements require precise footwork and coordination. Biomechanics studies the mechanics of foot placement, weight transfer, and joint angles during cuts, crossovers, and defensive slides to optimize agility and reduce injury risk.
4. Jumping and Landing Mechanics:
   - Biomechanics plays a critical role in jumping and landing techniques. It examines factors such as take-off angles, knee and ankle flexion, shock absorption during landing, and the distribution of forces to minimize impact and stress on joints.
5. Pivoting and Turning:
   - Pivoting and turning movements involve rotational forces on the feet and ankles. Biomechanics evaluates pivot techniques, pivot foot stability, and the mechanics of turning to enhance control, agility, and quick direction changes on the court.

Biomechanics

1. Ankle Stability and Support:
   - Biomechanical analysis considers ankle stability, strength, and flexibility, which are crucial for preventing ankle injuries and maintaining balance during dynamic movements. Proper footwear, ankle braces, and strengthening exercises can improve biomechanical support for the ankles.
2. Footwear Design:
   - Biomechanics influences the design of basketball shoes, including outsole patterns, cushioning systems, ankle support features, and traction technologies. These design elements aim to enhance foot movement, reduce fatigue, and provide support during gameplay.
3. Injury Prevention and Rehabilitation:
   - Biomechanical assessments help identify movement patterns that may contribute to foot and lower limb injuries, such as ankle sprains or plantar fasciitis. Biomechanics-based training programs and rehabilitation protocols focus on improving movement efficiency, addressing biomechanical imbalances, and reducing injury risk.

By understanding and optimizing biomechanics in foot movement, basketball players can improve their performance, agility, and overall foot health on the court. Coaches, trainers, and sports scientists use biomechanical analysis to develop customized training programs and strategies tailored to individual players' biomechanical needs and goals.

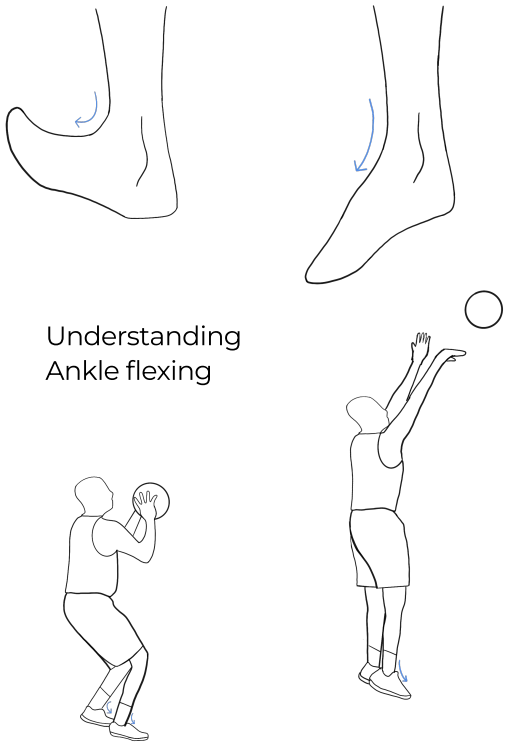


Injury prevention

Basketball players are susceptible to various injuries, such as **ankle sprains, knee injuries, and overuse injuries** due to the high-intensity and dynamic nature of the sport.

Using appropriate footwear that provides proper **support, cushioning, and traction is essential**. Basketball shoes designed to support lateral movements and absorb shock can prevent ankle sprains and other foot injuries. Additionally, the use of ankle braces or taping can offer extra support for players with a history of ankle injuries.





What to Look for in a Good Pair of Basketball Shoes

Cushioning
Cushioning is important for shock absorption. It blunts impacts to reduce the pressure on your feet, ankles, and knees. Well-made shoes often have cushioning that returns energy, propelling you forward when you run and upward when you jump. Basketball shoes are often cushioned with a combination of air, gel, and foam.

Support
Basketball players are at a high risk of ankle injuries due to the high-impact nature of the sport. Basketball sneakers with strong support in the arches and ankles give you extra stability. Not only does this help prevent injuries, it also gives you leverage and balance, improving your performance.

Traction
Traction allows you to make quick cuts and stops without slipping. Basketball shoes typically have grippy soles with a herringbone or hexagonal pattern on the outsole for maximum traction. These patterns help distribute weight and pressure evenly, reducing the risk of slipping. Before buying a pair of basketball shoes, consider whether you'll use them for indoor or outdoor play. Shoes for outdoor play tend to have a deeper tread pattern to improve traction on pavement, while those for indoor play have shallower treads that grip onto hardwood courts.

Breathability
Breathability is important because shoes that are too hot and sweaty can cause discomfort, blisters, and even athlete's foot. Breathable shoes help keep your feet cool and dry, which can improve comfort and reduce the chance of these issues.

Lightweight Construction
Basketball heavily emphasizes agility, speed, endurance, and jumping, so lightweight shoes are extremely important. Heavy shoes can slow you down significantly, decreasing your momentum and dragging down your jumps. Wearing heavy shoes can also increase fatigue over the course of a game. With lightweight basketball sneakers, you'll be able to cut and pivot faster, jump higher, and keep going longer.

What Are Basketball Shoes Made Of?

Synthetic Leather looks and feels like real leather, but it's lighter and more durable. Many basketball shoes use synthetic leather as the primary material.
Mesh is highly breathable and flexible. Many basketball shoes use strategically-placed mesh panels to improve airflow and mobility.
Foam provides cushioning and shock absorption. Some specialized foams also return energy to boost performance. Most basketball shoes have midsoles made of foam, as well as foam padding on the interior.
Rubber has excellent traction and durability. Most court shoes use rubber outsoles.

How Should Basketball Shoes Fit?

Basketball shoes should be snug, but not tight. They should have enough room for your toes to wiggle, but not so much that they slide around inside the shoe, which can cause blisters. Make sure that they have enough arch support and that your foot feels secure inside them. You shouldn't have to lace your shoes too tightly to get a good fit. When trying on shoes, wear the same socks, wrappings, and ankle braces you plan to play in. Always measure your feet or try on shoes at the end of the day when your feet are slightly swollen to avoid getting shoes that are too tight.

Breaking in New Basketball Shoes

When you get new basketball shoes, they can be stiff, which can restrict mobility and cause discomfort or blisters. To improve their flexibility, it's important to break them in before you play in them. You can do this by wearing them around the house for longer and longer periods of time. The typical break-in time for a new pair is about two weeks.

Taking Care of Basketball Shoes

Taking good care of your basketball shoes can improve their longevity. Keeping them fresh goes a long way, so it's important to remove your shoes from your bag after playing to let them air out. When your court shoes get dirty, make sure to follow the cleaning instructions. Strong cleaning solutions can damage synthetic leather or rubber, so it is best to use a mild solution like laundry detergent mixed with water. Clean your shoes using a soft cloth, and remove any stubborn dirt or scuffs with an old toothbrush. Don't wear indoor basketball shoes outside. Indoor shoes are designed for smooth surfaces like hardwood, and pavement or other rough surfaces can wear down their treads. This will reduce their ability to grip smooth surfaces, slowing you down and putting you at risk of slipping.

Data Analysis

1. Market Study

- Market Segmentation: The market is segmented into professional athletes, amateur players, and casual wearers, with each segment prioritizing different features.
- Price Sensitivity: Price sensitivity varied, with professional players willing to pay a premium for high-performance shoes, while amateur players and casual users sought value for money.
- Brand Dominance: A few key brands dominate the market, but there is growing interest in niche and emerging brands that offer innovative features.
- Trends: There is a rising trend toward eco-friendly and sustainable materials, with consumers increasingly prioritizing sustainability in their purchase decisions.
- Technology Integration: The integration of smart technology (e.g., sensors for tracking performance metrics) is gaining traction, particularly among competitive players.

2. User Study

- Comfort Preferences: Users prioritized comfort, particularly in terms of cushioning and fit, over other factors such as aesthetics.
- Shoe Durability: Durability was a major concern, with users expressing a preference for shoes that maintain their structural integrity over extended use.
- Style vs. Function: While aesthetics were important, functionality and performance were the primary drivers in users' purchasing decisions.
- Customization: A significant number of users expressed interest in customizable features, such as adjustable lacing systems or modular insoles.
- Brand Loyalty: The study revealed strong brand loyalty among users, with preferences often shaped by past experiences and brand reputation.

3. Biomechanics Analysis

- Foot Strike Patterns: Study of foot strike patterns revealed that most players land midfoot or forefoot, emphasizing the need for targeted cushioning in these areas.
- Ankle Movement: Analysis showed that high-top shoes offer better ankle support during lateral movements, reducing the risk of ankle sprains.
- Knee Joint Load: Shoes with better arch support and cushioning were found to reduce load on the knee joints, potentially lowering the risk of knee injuries.
- Energy Return: Materials with high energy return properties, like Boost or Zoom Air, were preferred for improving performance by enhancing jump height and responsiveness.
- Motion Control: The study highlighted the importance of a stable midsole and heel counter in controlling excessive pronation or supination.

4. Injury Prevention Study

- Common Injuries: The most common injuries among basketball players were ankle sprains, plantar fasciitis, and knee injuries, often linked to inadequate shoe support.
- Impact Distribution: Shoes with advanced cushioning systems were more effective in distributing impact forces, reducing the likelihood of stress fractures and soft tissue injuries.
- Ankle Support: High-top designs with reinforced ankle collars showed a significant reduction in the incidence of ankle sprains.
- Arch Support: Enhanced arch support was correlated with a decrease in cases of plantar fasciitis, especially in players with flat feet.
- Fit and Comfort: Proper fit and secure lacing systems were critical in preventing blisters, calluses, and other friction-related injuries.

5. Material Study

- Durability: Analysis of different materials revealed varying levels of wear resistance, with synthetic materials generally offering higher durability.
- Breathability: Mesh and other woven materials were found to provide better breathability, reducing moisture buildup and enhancing comfort during play.
- Weight: Lightweight materials, such as EVA foam for soles and synthetic uppers, were preferred for reducing overall shoe weight without compromising support.
- Flexibility: Materials like TPU (thermoplastic polyurethane) provided a balance of flexibility and support, crucial for dynamic movements in basketball.
- Shock Absorption: High-performance foam materials (e.g., Phylon, EVA) were identified as superior in absorbing impact forces, thereby reducing stress on the joints.

Each material offers unique properties suitable for different applications. Mesh and knit materials excel in breathability and comfort, making them ideal for sportswear and everyday apparel. Lycra adds significant stretch and flexibility, enhancing the fit and performance of activewear. TPU and PU provide durability and versatility, making them essential in footwear, protective gear, and various industrial applications.

Design Brief

Final Design Brief

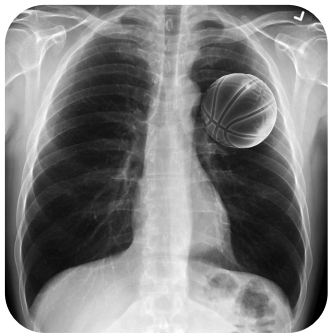
To develop a basketball shoe that prioritises player-centric features for optimal performance on outdoor courts.

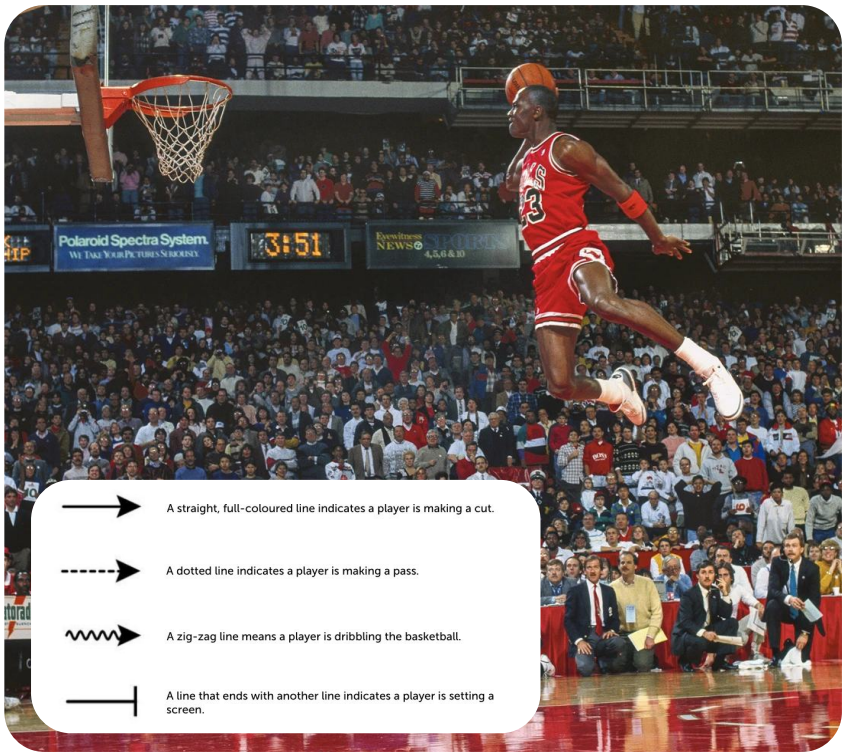
Mood Board & Inspirational Board

Mood Board




HORNETS
OKC
LAKERS
76ers
NUGGETS
KINGS
NETS
PISTONS




Polaroid Spectra System.
3:51
A straight, full-coloured line indicates a player is making a cut.
A dotted line indicates a player is making a pass.
A zig-zag line means a player is dribbling the basketball.
A line that ends with another line indicates a player is setting a screen.

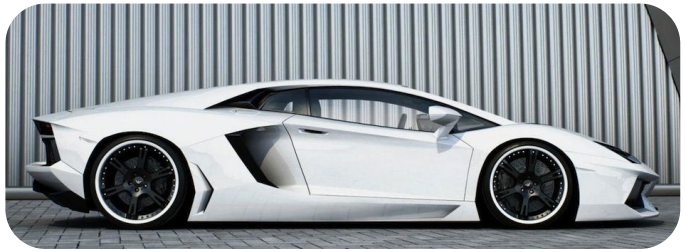
Inspiration Board



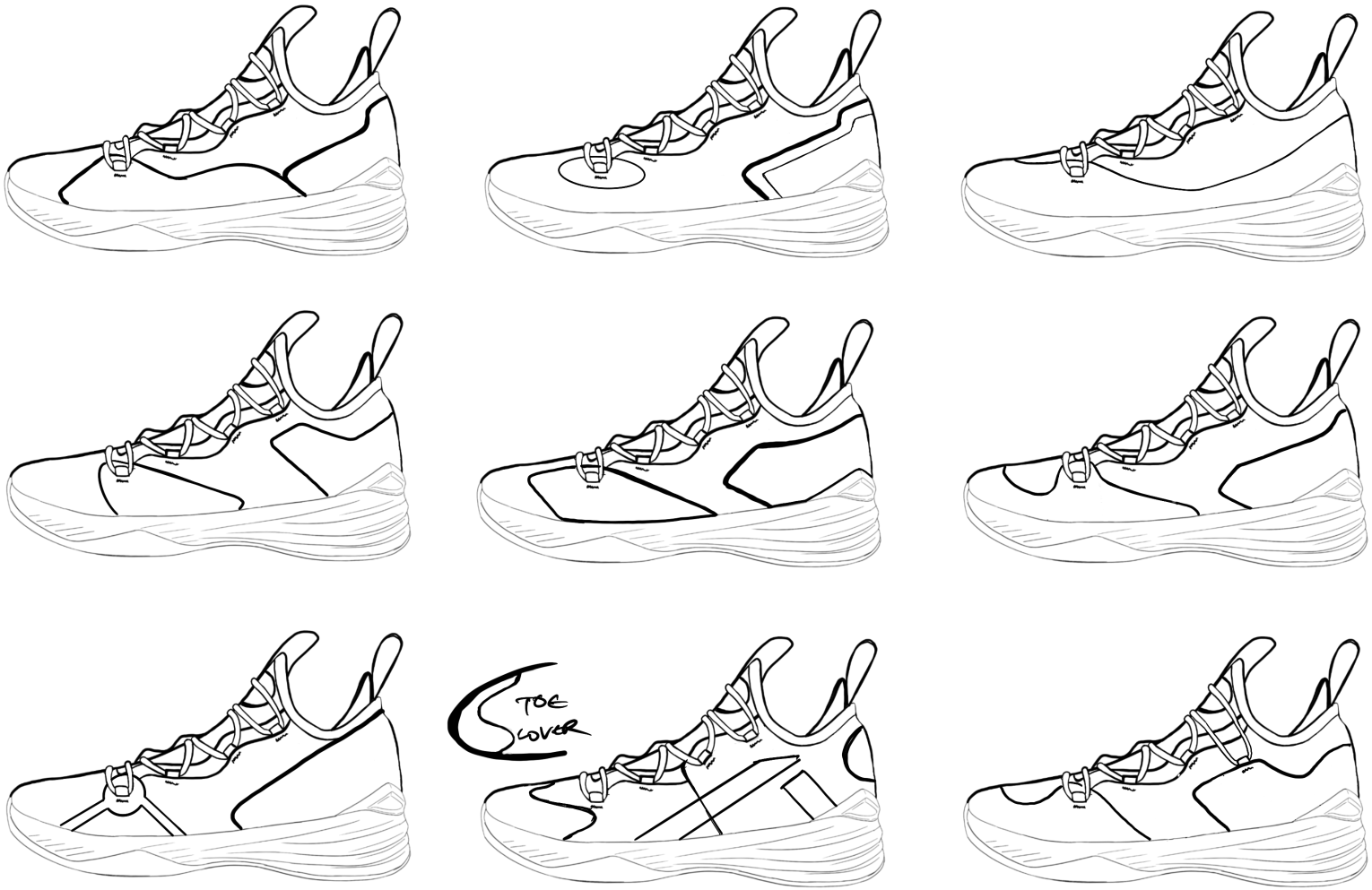




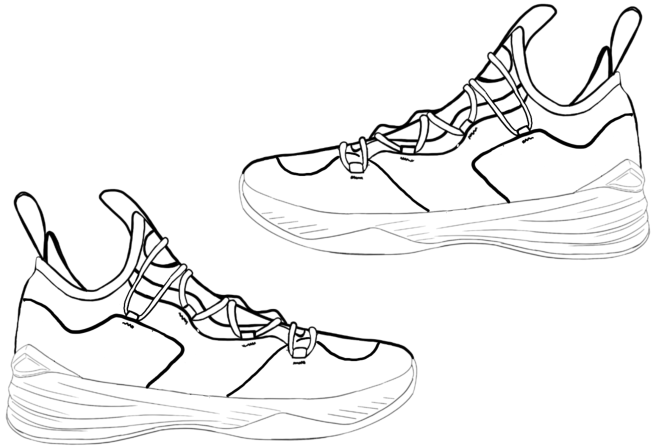


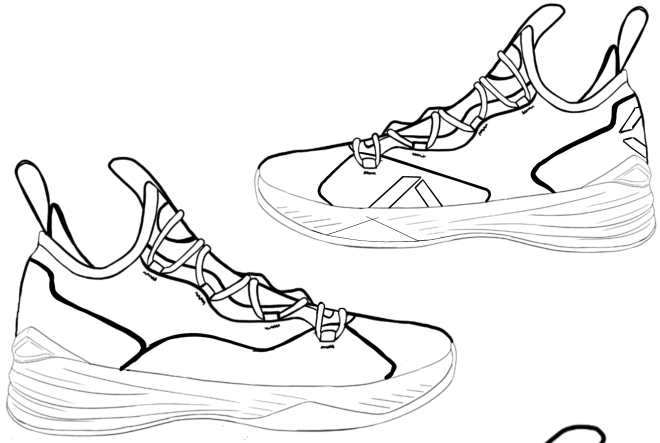


Ideation


TOE
COVER







After talking to my industry mentor he told me how this design will have issues while manufacturing as it is a single unit upper (upper and tongue are one).

He advised me to separate the same so that it is easy to manufacture.

Since I was changing the design I thought of increasing the functionality and make it more supportive.





Importance of mid foot support in basketball shoes

Midfoot support is a vital feature in basketball shoes, offering stability and balance during quick, multidirectional movements. It helps maintain proper foot alignment, which is essential for controlling balance and reducing the risk of slipping. This support is also crucial in preventing injuries by minimizing the chances of overpronation or supination, which can lead to strain and more serious injuries like plantar fasciitis or ankle sprains.

In addition to injury prevention, midfoot support enhances comfort and performance by distributing weight evenly and reducing fatigue, allowing players to maintain energy and agility throughout the game. It also accommodates different arch types, providing the necessary cushioning to absorb impact forces from running and jumping, which reduces stress on the foot and lower extremities. Moreover, basketball shoes with strong midfoot support are typically more durable, making them a better long-term investment for athletes.
4o

Lockdown Ideas

- Midfoot Straps or Bands:

Incorporate adjustable straps or bands across the midfoot area of the shoe. These straps can be tightened to provide a customized fit and additional support, especially during lateral movements and cuts on the court.

- External TPU or TPU Overlays:

Use thermoplastic polyurethane (TPU) overlays or external TPU cages on the midfoot section of the shoe. These overlays can offer targeted support and stability while maintaining flexibility in other areas of the shoe.

- Internal Support Structures:

Integrate internal support structures such as arch supports or TPU shanks within the midsole. These structures provide underfoot support and help distribute pressure evenly across the midfoot during intense activities.

- Tensioned Lacing System:

Implement a tensioned lacing system that specifically targets the midfoot area. This system can use reinforced eyelets or loops to apply pressure and support directly to the midfoot when the laces are tightened.

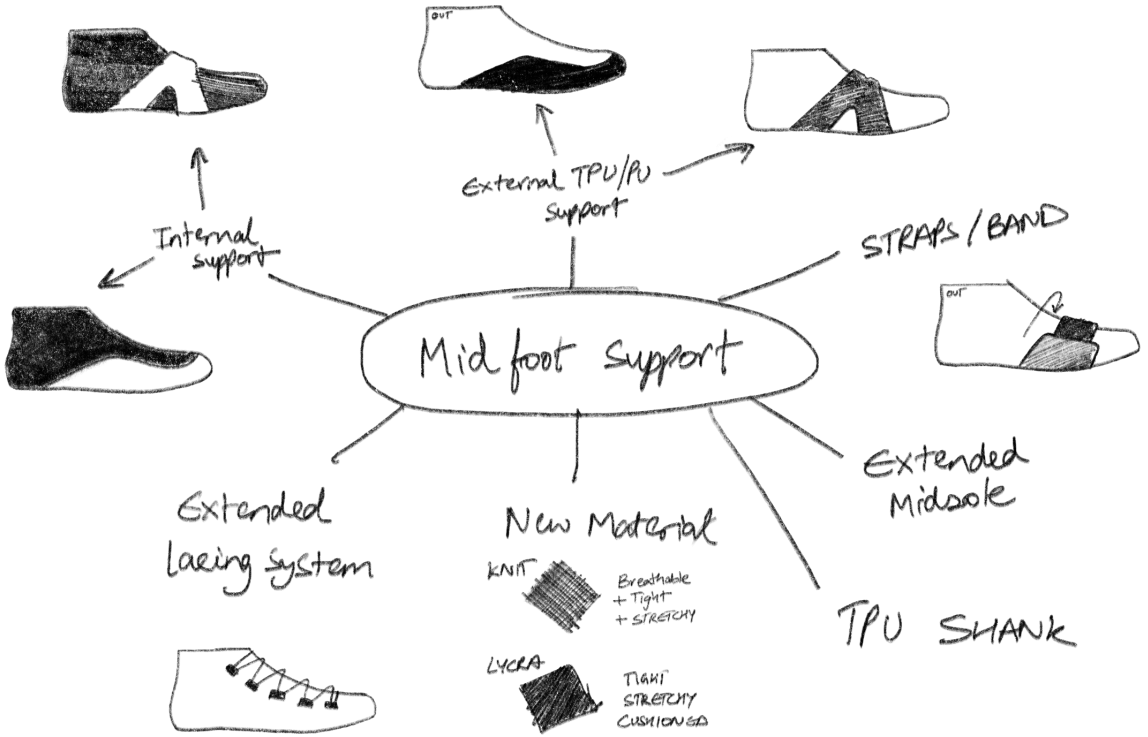
- Cushioned Collar and Tongue:

Include ample cushioning in the collar and tongue of the shoe, especially around the midfoot region. This cushioning provides comfort while also offering gentle support to the midfoot area.

- Material Selection:

Choose materials with supportive properties for the midfoot section, such as reinforced mesh, synthetic overlays, or engineered textiles. These materials offer both structural support and breathability.

Lockdown Sketch









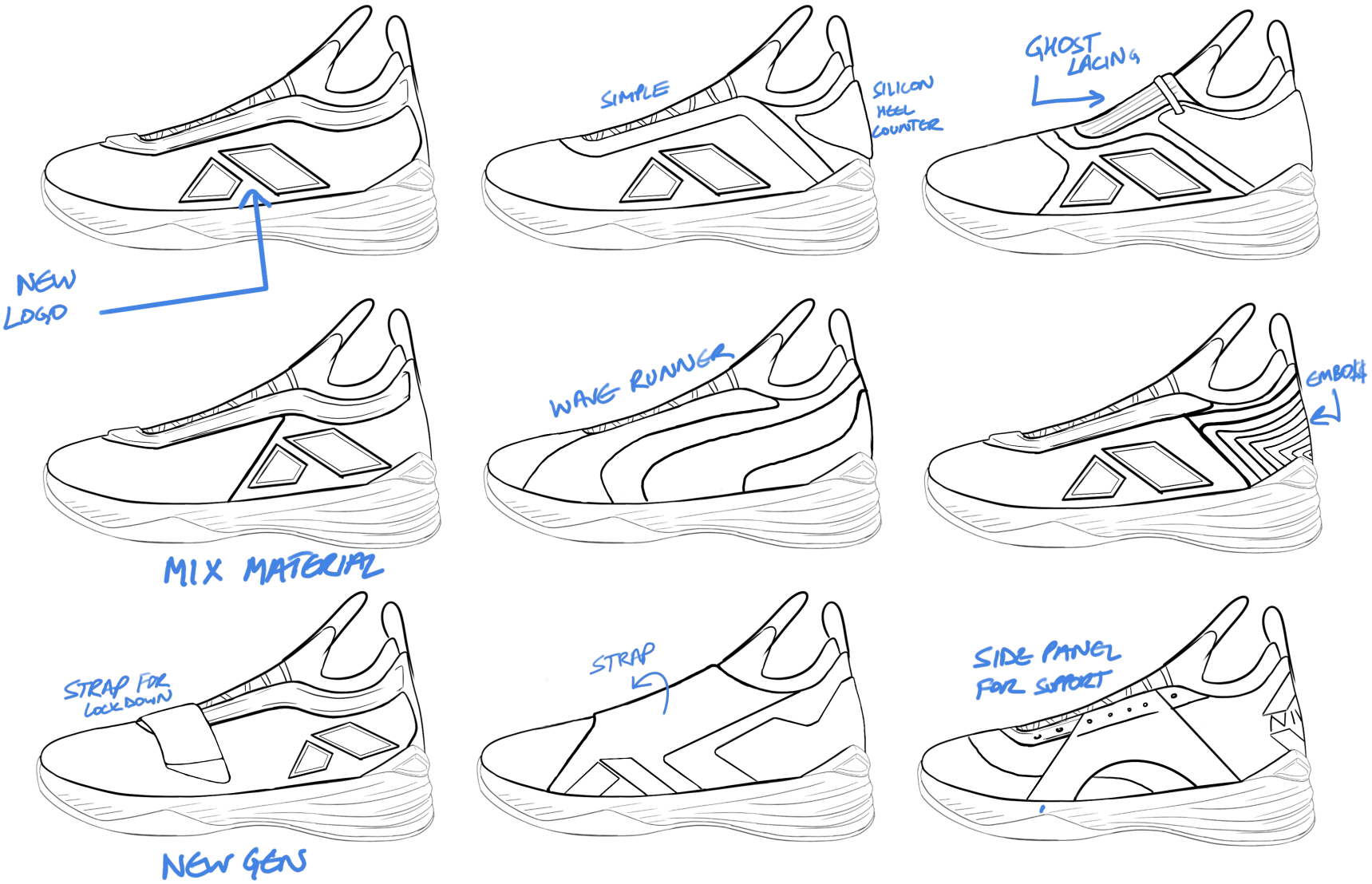


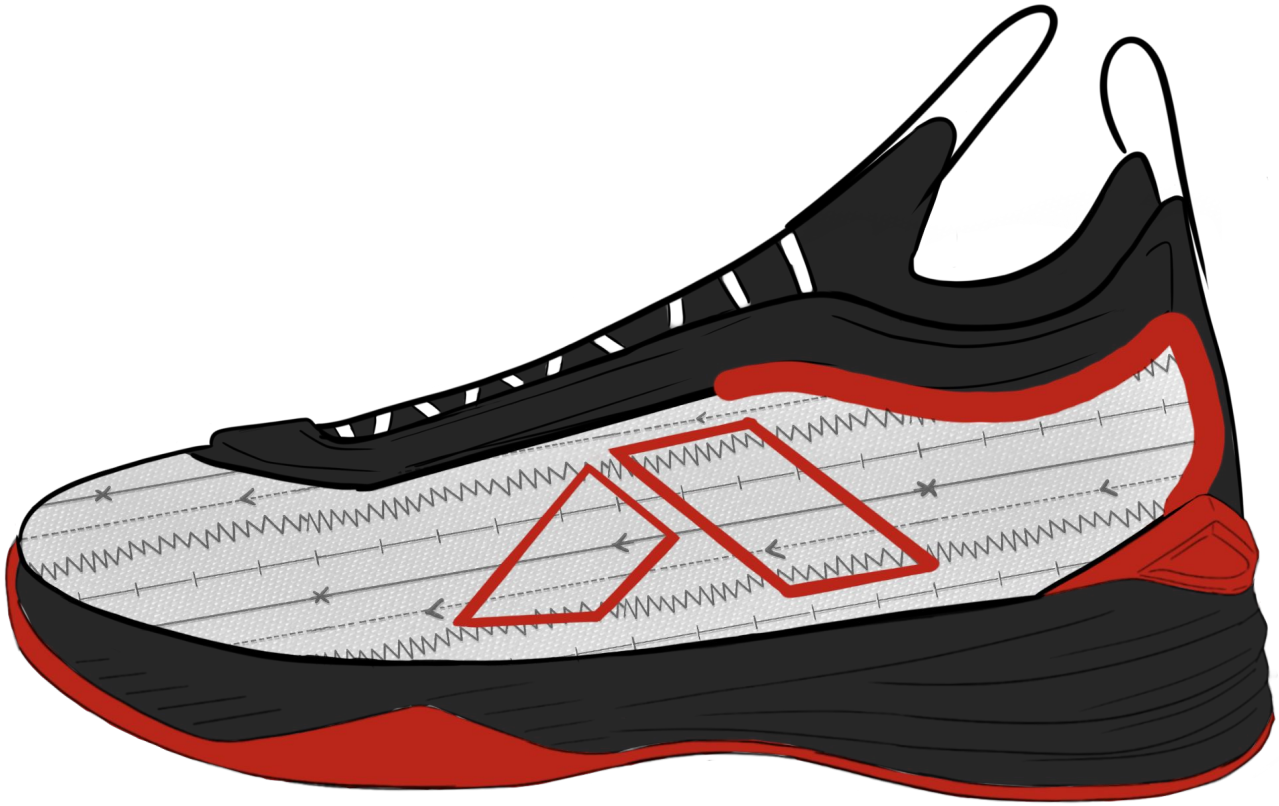


Once I achived what I wanted with the tongue I worked on the upper making it more simple and using colours suggested by users



Sample


NEW LOGO
SIMPLE
SILICON HEEL COUNTER
GHOST LACING
MIX MATERIAL
WAVE RUNNER
EMBOSS
STRAP FOR LOCKDOWN
NEW GEN
STRAP
SIDE PANEL FOR SUPPORT





Sample

Final Concept


NIVIA

Colour Combination

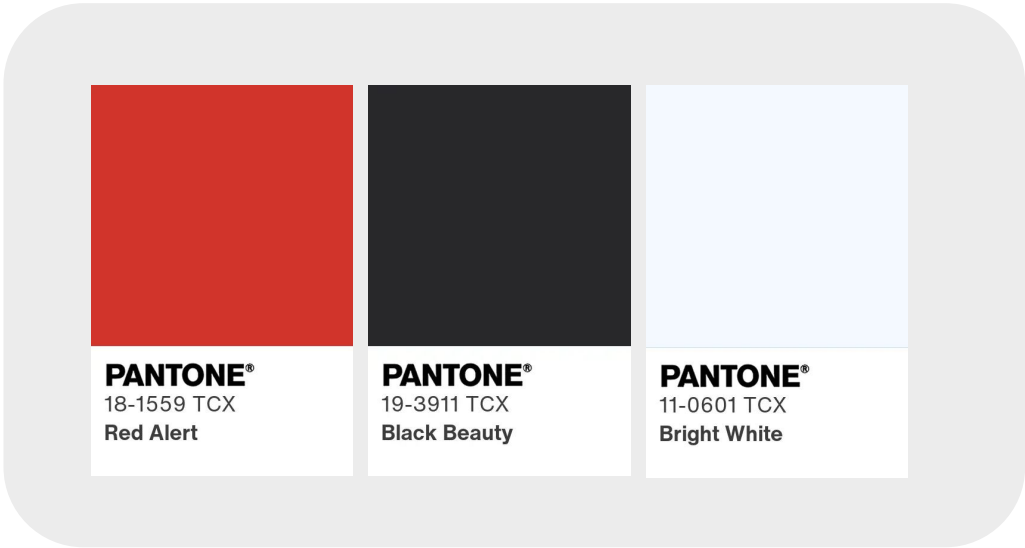
When choosing the color scheme for my basketball shoe concept, I opted for a combination of white, black, and red for several reasons. These colors not only offer a visually striking contrast, but they also carry significant meaning and appeal in the world of sports.

Red- passion, fearlessness, aggression

white- calm, peaceful, zen

black- powerful and elegance

Not only is this colour combination very iconic in the basketball world but it also represents the physical and mental state of a basketball player and how they present themselves



Manufactoring Process



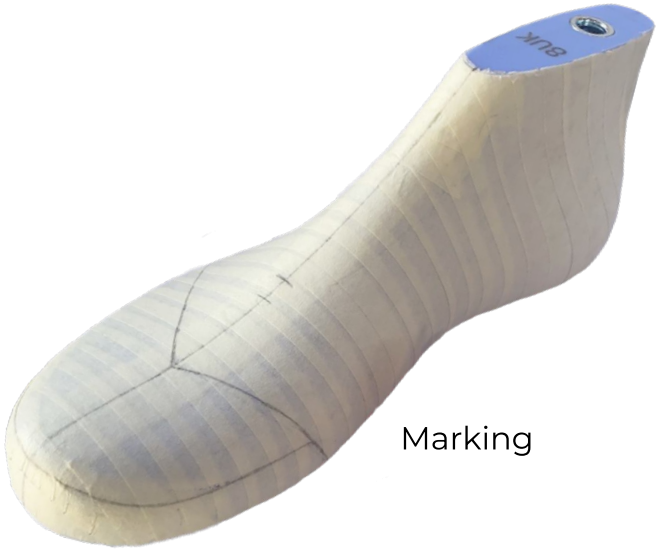
Last

A last is a 3D model of a foot around which the shoe is built. It dictates the fit and shape of the shoe.

The last is then taped with masking tape in such a way that there are no creases and it is layered one on top of another



Masking



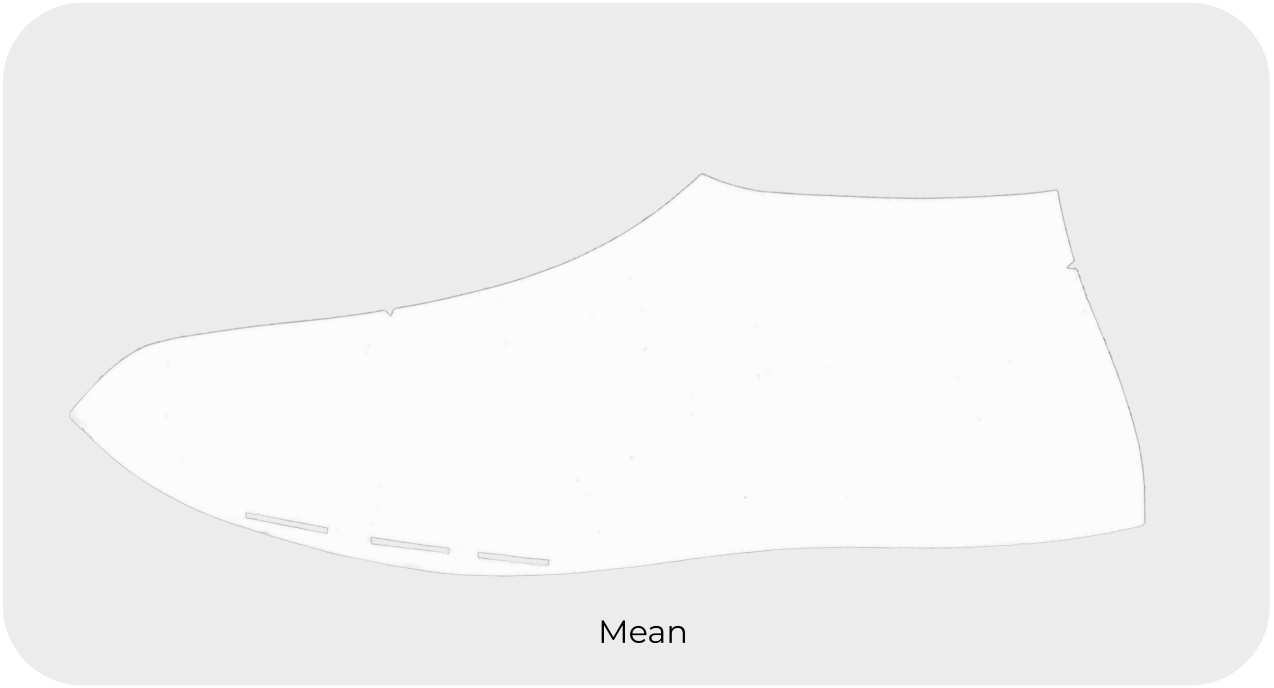
Marking

Once the last is tapped the ball points and the center are to be marked, to do so you have to hold it at an angle and mark while squinting your eyes for accuracy

Once It is marked it is then carefully cut along the center line to get two halves, the inner and the outer side of the foot. It is then flattened on a sheet of paper and cut out.

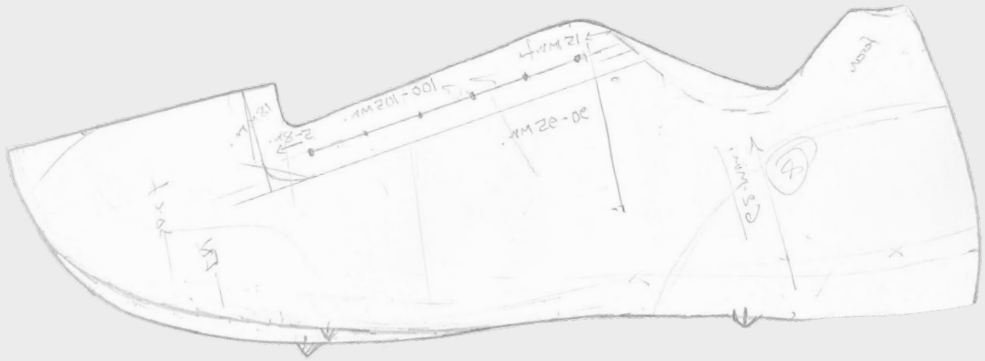


Cutting



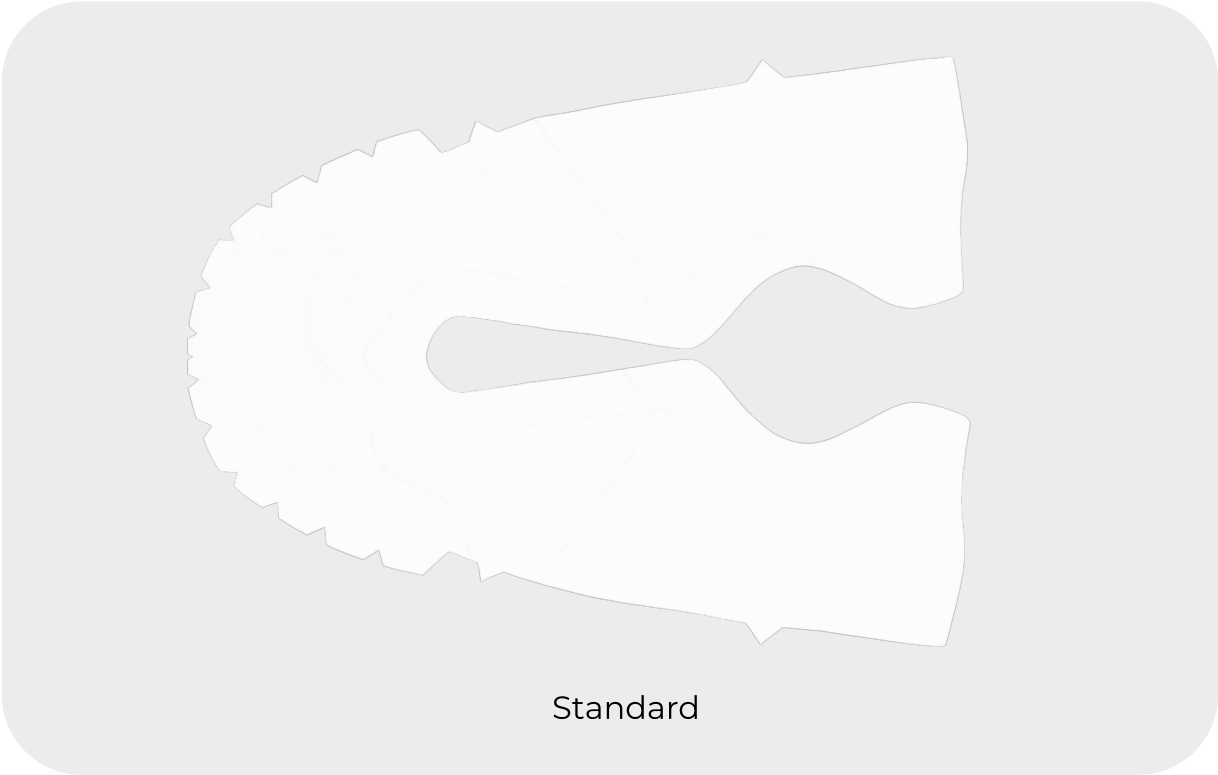
Mean

When you place the inner side over the outer side and mark the difference and estimate the mean line so that both inside and outside are symmetric
This is done to save on dies for different sides (left and right)



Standard

Once the mean form is found we cut out the eyelets and heel collar according to our design and measurements



Standard

The standard is then sketched out symmetrically and the standard form is made



Pattern

The Patterns are cut out individually for each component based on your design



Materials

The patterns are then traced on materials planned for your design and cut out



Printing

Screen Printing is the most common printing process done for graphics and logo on the materials, chemicals are added to the paint according to the material



Stitching

In my design the heel component was meant to be stitched before fusing the other components on it, this step may be different for different designs



Fusing

TPU is then fused on top of the upper to add strength, support and aesthetics to your design

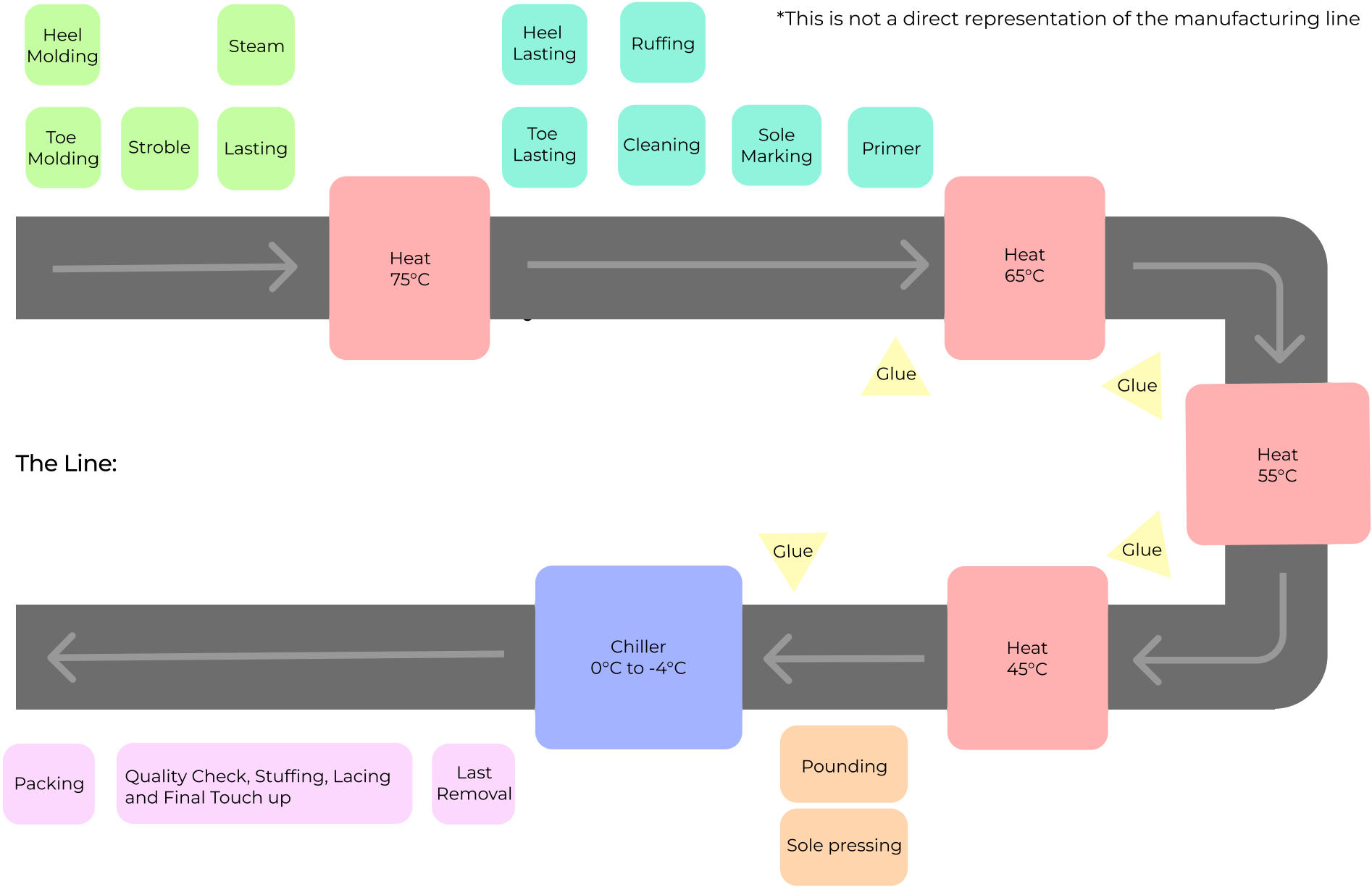


Construction

Once all the components are placed on the upper it is assembled and internal foam and heel counter are also added. Once the upper is ready it is then sent to “The Line”

*This is not a direct representation of the manufacturing line

The Line:

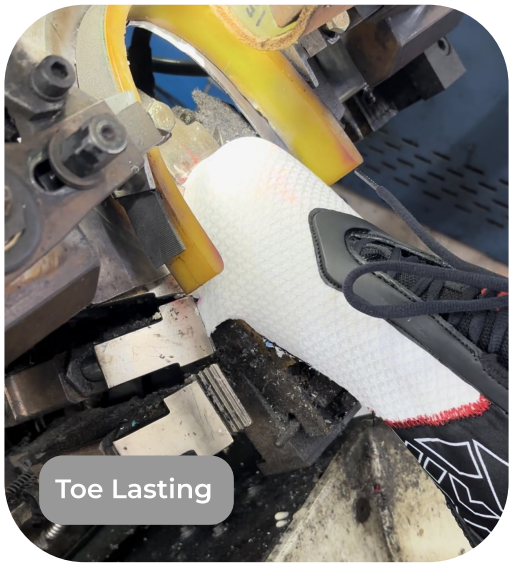




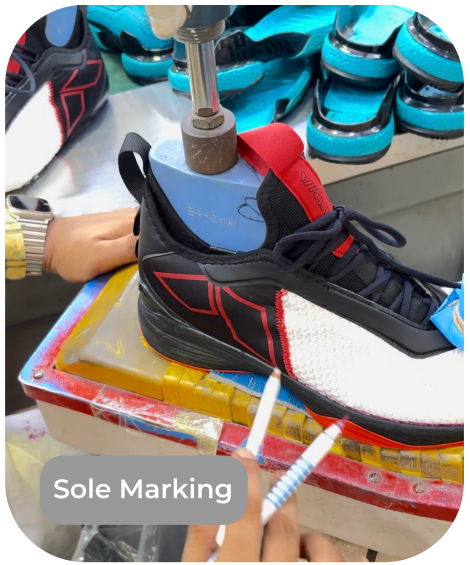




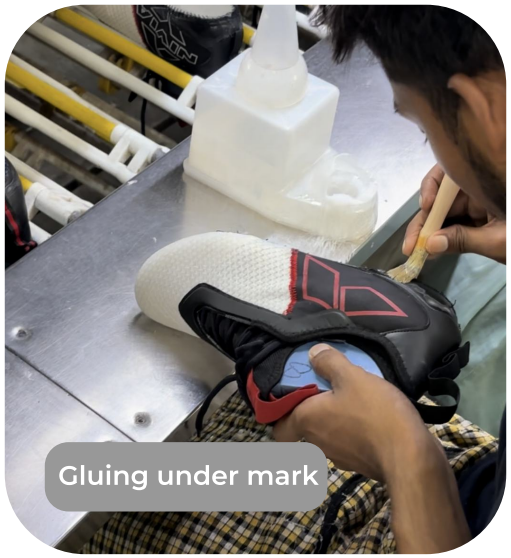
- **Toe Molding**
  This is done to give the toe of the assembled upper the structure of a toe
- **Heel Molding**
  This is done to give the heel of the assembled upper the structured curve
- **Stroble**
  Stroble is the layer which holds both the upper and sole together is is stitched to the upper and then glued to the sole
- **Steam**
  Once the stroble is attached it is then kept on pipes which release steam to loosen the material and prepare it for lasting
- **Lasting**
  Once the upper is loose enough the last is fitted into the upper and is now ready to take form
- **Heat 75°C**
  A layer of glue is appled on the stroble and tthe material near it to strengthen the upper and is passed through a heat machine at 75°C



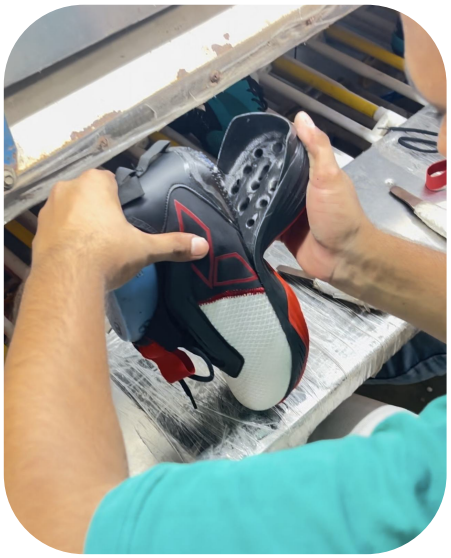




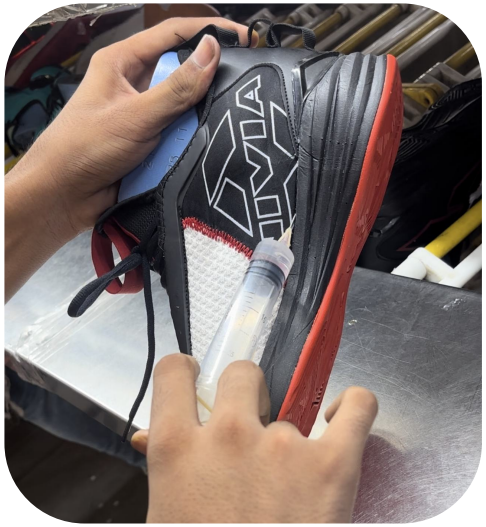
- **Toe and Heel Lasting**
  After it comes out of the machine it is placed for heel lasting where with the help of the internal last and external pressure
- **Ruffing**
  Once the upper has taken the shape of the last the edges are ruffed so they stick firmly to the sole
- **Cleaning**
  Dust particles are then removed with the help of acetone
- **Sole marking**
  The sole is then placed under the upper and a line is marked which is used as he guide to apply glue
- **Primer**
  First layer of glue is then applied on both the stroble and sole

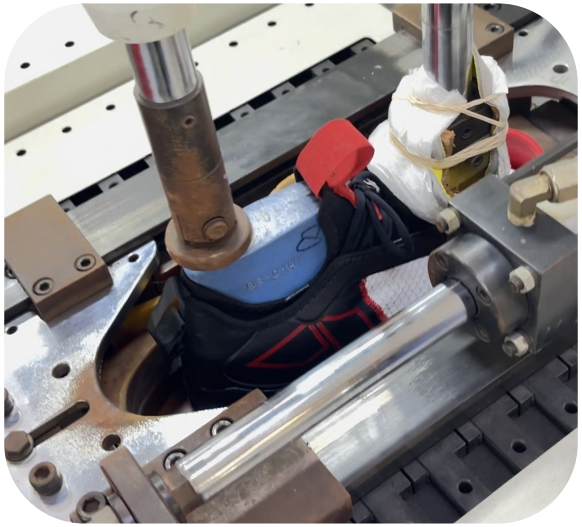

Gluing under mark


Heat machine



- **Glue**
  A layer of glue is applied and is placed in the heat machine at 65°C
- **Heat 65°C**
  The shoe goes through the heat machine many times graduall reducing the heat to help dry the glue slowly
- **Glue**
  A layer of glue is applied again and is placed in the heat machine at 55°C
- **Heat 55°C**
  The shoe goes through the heat machine again
- **Glue**
  Another layer of glue is applied to make sure the upper sticks properly to the sole
- **Heat 45°C**
  The shoe goes through the heat machine again this time at 45°C







- **Pounding**
  After the extensive gluing and heating the upper and sole are attached and kept in a pounding machine
- **Sole pressing**
  Similar to the Pounding machine the shoe goes through Sole pressing
- **Glue**
  Glue is now applied with the help of a
- **Chiller 0°C to -4°C**
- **Last Removal**
- **Quality Check, Stuffing, Lacing and Final Touch up**
- **Packing**

Final Sample










NIVIA

Advantages

Advantages

Material

Nylon fishnet Knit material makes the upper more durable while keeping it light and breathable

Support

It also comes with an extra layer of cusion support under the ankle which helps with lockdown.

Tongue

The shoe has a single booty rib tongue which provides support while giving a snug fit familiar to a sock.

It also makes it easier for the player to slide their foot into it to wear

TPU Plate

TPU shank present in the midsole helps with energy return which boosts a players performance

Colour Combination

The colours are trendy and versitile making it a shoe that can be worn on and off court

User Testing































User Feedback

User 1: Age 24 Size 12

"As someone who needs extra ankle support, these basketball shoes have surprised me. The ankle cushioning is super soft yet supportive, making me feel confident every time I touch the court. The comfort level is high, with a snug fit with the internal sock like tongue that wraps around my foot like it was custom-made for me. I also love how breathable they are. The overall support is excellent, giving me stability without feeling heavy."

User 2: Age 19 Size 8

"I've been wearing these basketball shoes for a few days, and overall, they've been pretty solid. The comfort is excellent, especially after breaking them in. The ankle cushioning provides good protection without feeling too bulky, which I appreciate. The support is decent, though I feel it could be a bit firmer in the midfoot area. The snug fit is nice, but it took a few wears to get used to, as it was a bit tight at first. As for breathability, they do a great job of keeping my feet cool, even during intense games. I wouldn't say they're perfect, but they definitely get the job done."

User 3: Age 29 Size 8

"I originally wore these shoes to play basketball,but they've ended up being my go-to pair for daily wear as well. the upper gives a secure feel that's perfect for both on and off the court. The ankle cushioning is just right,not too soft, but supportive enough to prevent any discomfort. Breathability is great, which is a huge plus for wearing them all day. The support is good, though I did feel a slight lack of cushioning under the heel during longer walks."

Constraints

Limited material

Since Nivia does not manufacture themselves they keep a limited amount of material for sampling.

Excess stock of Old Soles

Nivia has not focused on the basketball segment and hence the sole is old and outdated.

Less time for Sampling

There were many events which took place during my time at Nivia and hence I was not able to make the most of it.

My learnings

Industrial Knowledge

Not only did I learn about the Footwear Industry but the Sports

Pattern making

I learnt pattern making manually which helped me better understand the basics of Footwear Development.

Manufacturing process

I spent a lot of time in the factory and now I am familiar to the

Team work

I worked with a team of experienced designers and learnt alot from them.

Thank You

Nivia Sports
Raj Menon
JK Lakshmipat University
Batch of 2020

NO FAILURE IS FINAL. NO SUCCESS IS PERMANENT
~RUSS

Refrences

https://bleacherreport.com/articles/1519230-from-chuck-taylor-to-lebron-x-year-by-year-evolution-of-nba-sneakers

https://runrepeat.com/basketball-shoe-statistics

https://ace-pt.org/ace-physical-therapy-and-sports-medicine-institute-high-top-vs-low-top-sneakers-and-ankle-sprains/#:~:text=Most%20shoes%2C%20up%20to%2085,might%20lead%20to%20knee%20injuries.

https://www.betterhealth.vic.gov.au/health/healthyliving/basketball-preventing-injury

https://www.latimes.com/fashion/la-ig-sneakers-basketball-sneaker-timeline-20190214-htmlstory.html

https://blog.decathlon.in/articles/popular-sports-in-india-a-complete-list

https://www.flaunt.com/blog/huupe#:~:text=Basketball%20is%20officially%20the%20fastest,sports%20audience%20continues%20to%20grow.

https://www.britannica.com/sports/basketball/U-S-high-school-and-college-basketball

https://loomfootwear.com/blogs/news/how-can-your-shoes-affect-your-health-effects-of-wearing-bad-shoes#:~:text=First%20of%20all%2C%20the%20shoe,move%20your%20feet%20around%20freely.

https://jhuti.com/blogs/advice/how-to-choose-basketball-shoes

https://www.underarmour.com/en-us/t/playbooks/basketball/best-basketball-shoes/

https://vmkonsport.com/types-of-basketball-courts/

https://huffsports.com/how-to-tell-if-basketball-shoes-are-indoor-or-outdoor/

https://correcttoes.com/foot-help/basketball-series-all-about-shoes-by-andrew-wojciechowski-nd/