

**“THE IMPACT OF IMPLEMENTING 3D VISUALIZATION ON THE
GROWTH OF FURNITURE COMPANIES IN BANGLADESH”**

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Multimedia and Creative Technology

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DAFFODIL INTERNATIONAL UNIVERSITY

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19th –AUGEST-2023

APPROVAL

This Project titled “**THE IMPACT OF IMPLEMENTING 3D VISUALIZATION ON THE GROWTH OF FURNITURE COMPANIES IN BANGLADESH**”, submitted by **Mostafizur Rahman Bhuiyan** to the Department of Multimedia and Creative Technology, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Multimedia and Creative Technology and approved as to its style and contents. The presentation has been held on 19th August 2023.

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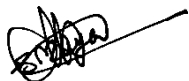


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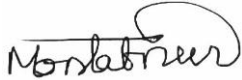
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ABSTRACT

In today's world, the impact of online shopping has increased manifold. Even in Bangladesh, its effect is being noticed. In the marketplace of Bangladesh, all types of products are mainly dealt with, furniture is one of them. If we talk about furniture, then there are many reputed furniture companies who also sell online. However, the websites display their furniture as two dimensional. Under the influence of modern technology, many companies have started displaying their product as three-dimensional like Hatil already started showing their product their product Hatil have already started displaying their products in three dimension. Purchasing furniture online poses unique challenges, as customers often struggle to visualize how items will fit into their spaces and complement existing décor. In this context, 3D furniture design emerges as a powerful solution, revolutionizing the online shopping experience and significantly impacting e-commerce sales. 3D furniture design bridges the gap between the virtual and physical worlds, enabling customers to make informed purchasing decisions and enhancing their overall satisfaction. 3D models of furniture, allowing customers to explore products from various angles, zoom in on intricate details. Such immersive experiences foster a sense of confidence and trust in the product, mitigating concerns regarding size, color, and overall design compatibility. Through interactive 3D models, customers can manipulate furniture items, change colors, fabrics, and materials. This level of interactivity empowers consumers, enabling them to personalize their choices and envision the furniture within their own living spaces, thereby minimizing post-purchase dissatisfaction. 3D furniture design impacts on reducing returns and enhancing customer satisfaction. By offering an accurate representation of products, customers can make decisions that are more informed. Consequently, this leads to a reduction in costly returns, benefiting both consumers and retailers. Additionally, the increased customer satisfaction stemming from a better understanding of the product's features and aesthetics fosters positive reviews, referrals, and repeat purchases, thereby boosting e-commerce sales.

TABLE OF CONTENTS

CONTENTS	PAGE
Approval	ii
Declaration	iii
Acknowledgement	iv
Abstract	v
Table of Contents	vi-vii
List of Figures	viii-x
CHAPTER 1: INTRODUCTION	1-4
1.1 Introduction	1
1.2 Motivation	2
1.3 Problem Identification	3
1.4 Objective	3
1.5 Expected Outcome	3-4
CHAPTER 2: BACKGROUND STUDY	5-7
2.1 Introduction	5
2.2 Competitive Analysis	6-7
CHAPTER 3: LITERATURE REVIEW	8-9
3.1 Introduction	8
3.2 Overview of the Furniture Industry in Bangladesh	8
3.3 Importance of Visual Presentation in Furniture Marketing	8-9
4.4 Benefits of 3D Visualization for Furniture Companies	9
5.5 Challenges	9
CHAPTER 4: CASE STUDY	10-11

4.1 Introduction	10
4.2 Case Study 1	10
4.3 Case Study 2	11
4.4 Case Study 3	11
CHAPTER 5: WORK PROCESS	12
5.1 Thought process	12-13
5.2 Pre-production	13-14
5.2.1 Survey Question	14-17
5.2.2 Idea Generation	17
5.2.3 Collect Reference	18
5.2.4 Analysis	18-21
5.2.5 Sketch	21-24
5.2.6 Project timeline	24
5.3 Production	25
5.3.1 Modeling	25-32
5.3.2 UVW	32-33
5.3.4 Lighting	34
5.3.5 Rendering	34-37
5.3.6 Final Output	37-47
CHAPTER 6: CONCLUSION	48
CHAPTER 7: FEFERENCE	49

LIST OF FIGURES

FIGURES	PAGE
Figure 5.2.1.1: Survey result about age	14
Figure 5.2.1.2: Survey result about gender	14
Figure 5.2.1.3: Survey result occupation	15
Figure 5.2.1.4: Survey result about familiar with the concept of 3D visualization	15
Figure 5.2.1.5: Survey result about user experience	15
Figure 5.2.1.6: Survey result about user opinion	16
Figure 5.2.1.7: Survey result about importance for customer satisfaction	16
Figure 5.2.1.8: Survey result about how likely user to purchase furniture	16
Figure 5.2.1.9: Survey result about how 3D visualization technology importance in Bangladesh	17
Figure 5.2.1.10: Survey result about user interested or not in using (AR) (VR) technologies in furniture products	17
Figure 5.2.3:1: Logo of 3ds max	19
Figure 5.2.3:2: V-ray for 3ds max	20
Figure 5.2.3:3: logo of Autodesk Maya	20
Figure 5.2.3:4: Rizom UV interface	21
Figure 5.2.3:5: Substance Painter interface	21
Figure 5.2.4:1: Sketch of Bookcase	22
Figure 5.2.4:2: Sketch of Tea Table	22
Figure 5.2.4:3: Sketch of Squire Table	23
Figure 5.2.4:4: Sketch of Almira	23
Figure 5.2.4:5: Sketch of Tea Table	24
Figure 5.2.5:1: Gantt chart for project timeline	24
Figure 5.3.1.1: 3Ds Max view all parts of the table	25
Figure 5.3.1.2: 3Ds Max view of Almira	26

Figure 5.3.1.3: 3Ds Max view of the Squire shape table	26
Figure 5.3.1.4: 3Ds Max view of the Bench	27
Figure 5.3.1.5: 3Ds Max view of the Dining table	28
Figure 5.3.1.6: 3Ds Max view of the bookshelf	28
Figure 5.3.1.7: 3Ds Max view of the Sofa	29
Figure 5.3.1.8: 3Ds Max view of the chair	29
Figure 5.3.1.9: 3Ds Max view of the round table	30
Figure 5.3.1.10: 3Ds Max view of the TV table	30
Figure 5.3.1.11: 3Ds Max view of the showcase	31
Figure 5.3.1.12: 3Ds Max view of the Dining table	31
Figure 5.3.1.13: 3Ds Max view of the TV set	32
Figure 5.3.2.1: Unwrapped model on Rizom UV	33
Figure 5.3.2.2: PBR texture sets of table	33
Figure 5.3.5.1: TV set render interface view in Autodesk 3ds Max	35
Figure 5.3.5.2: Dining table render interface in Autodesk 3ds Max	36
Figure 5.3.5.3: Almira Render interface view in Autodesk 3ds Max	36
Figure 5.3.5.4: Showcase Render interface view in Autodesk 3ds Max	37
Figure 5.3.6.1: Table close view in Sketchfab	38
Figure 5.3.6.2: Bookshelf close to open view in Sketchfab	38
Figure 5.3.6.3: TV cabinet open view in Sketchfab	39
Figure 5.3.6.4: Almira close view in Sketchfab	40
Figure 5.3.6.5: Multiple use of center table view in Sketchfab	40
Figure 5.3.6.6: Sketchfab center table multiple use	41
Figure 5.3.6.7: Traditional sofa and table view in Sketchfab	41
Figure 5.3.6.8: Bench and table view in Sketchfab	42
Figure 5.3.6.9: Round table and tool view in Sketchfab	42
Figure 5.3.6.10: Reading table view in Sketchfab	43
Figure 5.3.6.11: TV cabinet view in Sketchfab	43
Figure 5.3.6.12: Squire shape table and tools view in Sketchfab	44
Figure 5.3.6.13: Single bed view in Sketchfab	44

Figure 5.3.6.14: Bookshelf view in Sketchfab	45
Figure 5.3.6.15: Bed side table view in Sketchfab	45
Figure 5.4.4.16: Traditional bench view in Sketchfab	46
Figure 5.4.4.17: Park bench and table view in Sketchfab	46
Figure 5.4.4.18: Minimalist sofa view in Sketchfab	47
Figure 5.4.4.19: Center table View in Sketchfab	47

CHAPTER 1

INTRODUCTION

1.1 Introduction

The present world has advanced a lot in terms of technology. Along with that, Bangladesh is also moving forward. Tag companies are leaning toward metaverse. Bangladesh is one of the most populous countries in South Asia. The people of this country are very aware in terms of technology and everyone started getting its benefits. Different countries of the world have started using three dimension of technology in expanding their business. The lack of three dimensions can be noticed in the expansion of online business in our country. There are some furniture companies in Bangladesh that are blessed with many reputations they display their products online as second image on their website. By doing this, the customer cannot verify the products in that way. 3D product visualization is an extremely useful set of tools and solutions for selling products online. It is also a new form of visual marketing for Bangladesh that gives businesses the ability to provide an interactive, photorealistic representation of products. Today, most customer interactions occur online. Due to the current technological progress in Bangladesh, very few people now-a-days go to the market and buy the products. Most of those who do getting a general idea from online. People are no longer restricted to viewing a single image of a product they can now explore the product in three dimensions in an interactive environment. This type of virtual tour encourages users to physically interact with the products displayed in this environment mobile, tablet and computer. The purpose of this study is to delve into the advantages and implications of incorporating 3D visualization technology into the sales process within the context of the furniture industry in Bangladesh. By examining the potential impact, we seek to understand how this technology can enhance the customer experience and contribute to the growth and competitiveness of furniture businesses in the country.

The integration of 3D visualization technology holds significant potential for the furniture industry in Bangladesh. By providing customers with an enhanced and

interactive buying experience, businesses can differentiate themselves in a competitive market, drive sales, reduce returns, and build customer loyalty. Through this thesis, we will delve deeper into this topic, examining its advantages, challenges, and potential implications for the growth of the furniture industry in Bangladesh.

1.2 Motivation

Current Challenges: The furniture industry in Bangladesh faces several challenges, including limited customer engagement and operational inefficiencies.

Competitive Landscape: With a growing number of furniture companies globally adopting 3D visualization, there is an increasing need for companies in Bangladesh to keep pace and remain competitive.

Customer Expectations: Modern consumers have higher expectations for interactive and immersive shopping experiences, including the ability to visualize furniture in a realistic 3D format.

Potential Benefits: Implementing 3D visualization can lead to improved sales, enhanced customer satisfaction, reduced returns, and a competitive edge in the market.

Industry Growth Potential: By embracing this technology, furniture companies in Bangladesh can tap into the rising demand for visually immersive online shopping experiences and drive industry growth.

Positive Impact: The implementation of 3D visualization not only benefits individual furniture companies but also contributes to the overall growth and development of the furniture industry in Bangladesh.

1.3 Problem Identification

While furniture companies around the world are increasingly using 3D visualization to display their products, the majority of furniture companies in Bangladesh have not adopted this technology. This lack of 3D visualization poses several challenges, including reduced sales, limited customer growth, and increased product returns. Without the ability to provide customers with an immersive and interactive shopping experience, furniture companies in Bangladesh may struggle to meet customer expectations and compete effectively in the market.

1.4 Objective

To examine how the integration of 3D visualization technology can enhance sales in the furniture industry.

To explore the ways in which 3D visualization can improve customer experience and satisfaction.

To assess the impact of 3D visualization on operational efficiency and the reduction of returns.

To understand how the adoption of 3D visualization can provide a competitive advantage and improve the market positioning of furniture companies in Bangladesh.

1.5 Expected Outcome

The expected outcomes of implementing 3D visualization in the furniture industry in Bangladesh can have a significant impact on the growth and competitiveness of companies.

I. **Increased Sales:** The implementation of 3D visualization technology can lead to increased sales for furniture companies. By providing customers with a realistic and immersive view of furniture products, it enhances their understanding and confidence in their purchasing decisions.

II. **Improved Customer Satisfaction:** 3D visualization allows customers to explore

furniture products in detail, enabling them to make more informed choices. By offering a visual representation of size, design, color, and material options, customers can customize and personalize their furniture selections according to their preferences.

- III. **Reduced Product Returns:** One of the significant benefits of 3D visualization is its potential to reduce product returns. By providing customers with an accurate representation of furniture products, including size, color, and design, it minimizes the risk of mismatched expectations.

- IV. **Competitive Advantage:** Implementing 3D visualization in the furniture industry can give companies a competitive edge. It allows them to differentiate themselves by providing a unique and interactive shopping experience.

- V. **Enhanced Marketing and Branding:** 3D visualization provides opportunities for creating engaging marketing materials, such as high-quality visuals, videos, and interactive product displays. This can strengthen brand perception and increase brand awareness in the market.

CHAPTER 2

BACKGROUND STUDY

2.1 Introduction

Bangladesh's furniture sector is a major employer and driver of GDP growth, making a considerable contribution to the national economy. But marketing furniture to clients effectively presents a significant barrier for the sector. The majority of furniture businesses in Bangladesh have not yet adopted this technology, despite the global trend of furniture companies employing 3D visualization to promote their products. There are a number of issues caused by the lack of 3D visualization, including lower sales, slower customer growth, and more product returns. Without the ability to provide customers with an immersive and interactive shopping experience, furniture companies in Bangladesh may struggle to meet customer expectations and compete effectively in the market. Bangladesh has seen a remarkable increase in internet penetration over the past few years. The government's initiatives to expand internet infrastructure and the availability of affordable smartphones have played a crucial role in connecting more people to the internet. As more individuals gain access to the online world, the potential customer base for online businesses expands, driving growth in the sector. The rise of e-commerce platforms in Bangladesh has made it easier for businesses to establish an online presence and reach customers across the country. The online furniture business in Bangladesh has also witnessed significant growth in recent years. Online furniture businesses offer convenience and accessibility to customers. Instead of physically visiting multiple stores, customers can browse through a wide range of furniture options from the comfort of their homes. They can easily compare prices, designs, and features before making a purchase. Many online furniture stores now utilize virtual visualization tools that allow customers to visualize how the furniture would look in their space.

2.2 Competitive Analysis

While more and more furniture businesses worldwide are adopting 3D visualization to showcase their products, most furniture businesses in Bangladesh still have not embraced this technology. .

HATIL Furniture is a renowned furniture company in Bangladesh that offers furniture with a 3D view. Here are some additional details about HATIL Furniture and its 3D visualization feature:

Company Background: HATIL Furniture is one of the leading furniture manufacturers and retailers in Bangladesh. It has established a strong presence in the market with a reputation for quality craftsmanship and innovative designs. The company offers a wide range of furniture products, including residential, office, and institutional furniture.

3D Visualization Feature: HATIL Furniture stands out in the industry by offering a 3D visualization feature for its furniture products. This feature allows customers to view and interact with furniture items in a virtual 3D environment. By leveraging advanced technology, customers can rotate, zoom in, and examine furniture pieces from various angles, providing a realistic and immersive experience.

Benefits of 3D Visualization: The 3D visualization feature offered by HATIL Furniture brings several benefits to customers. It enables them to visualize furniture items in their intended space, helping them make informed decisions about size, design, and placement. This feature also allows customers to assess how the furniture will harmonize with their existing décor and overall interior design, improving the purchasing experience.

Customization Options: In addition to providing a 3D view of their standard furniture designs, HATIL Furniture offers customization options. Customers can personalize their furniture selections by choosing from a range of materials, colors, finishes, and configurations. The 3D visualization feature allows customers to see how their customization choices will look before making a purchase, ensuring that the final product meets their preferences.

Online Presence and User Experience: HATIL Furniture has an online platform where customers can explore their furniture collection and access the 3D visualization feature. The website provides a user-friendly interface that allows customers to browse different furniture categories, view product details, and visualize items in 3D. This enhances the convenience and accessibility of the furniture shopping experience.

Competitive Advantage: HATIL Furniture's offering of 3D visualization gives them a competitive advantage in the market. It sets them apart from other furniture companies in Bangladesh that may not provide a similar feature. The 3D visualization feature enhances customer engagement, reduces uncertainty, and increases customer satisfaction, ultimately contributing to the company's growth and market position.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

This chapter presents a comprehensive review of relevant literature on the implementation and impact of 3D visualization in the furniture industry. It explores studies, research articles, and industry reports to gather insights into the benefits, challenges, and best practices associated with incorporating three-dimensional visualization technology. The literature review aims to establish a theoretical foundation for understanding the potential impact of 3D visualization on the growth and performance of furniture companies.

3.2 Overview of the Furniture Industry in Bangladesh

The furniture industry in Bangladesh holds considerable importance in the country's economy. The furniture industry in Bangladesh has a long history rooted in traditional craftsmanship. Local artisans have been producing furniture using traditional techniques and materials for many years. However, with the advent of modern technology and evolving consumer preferences, the industry has undergone significant transformations. Presently, the furniture industry in Bangladesh is experiencing growth and diversification. The furniture market in Bangladesh has witnessed steady growth over the years. Factors such as rapid urbanization, increasing disposable incomes, and changing consumer lifestyles have contributed to the expansion of the market. Several manufacturing clusters have emerged in Bangladesh, with regions like Dhaka, Chittagong, Gazipur, and Narayanganj being major furniture production hubs. The furniture industry in Bangladesh has shown considerable potential for exports. The country exports furniture products to various international markets, including the United States, Europe, Australia, and the Middle East. Recognizing the importance of the furniture industry, the government of Bangladesh has taken initiatives to support its growth.

3.3 Importance of Visual Presentation in Furniture Marketing

This section examines the significance of visual presentation in the marketing of furniture products. It discusses the role of aesthetics, design, and visual appeal in influencing

consumer preferences and purchase decisions. Furthermore, it explores the limitations of traditional two-dimensional visual representations and highlights the need for more immersive and realistic experiences provided by 3D visualization.

3.4 Benefits of 3D Visualization for Furniture Companies

In this section, the literature review examines the potential benefits that furniture companies can derive from implementing 3D visualization technology. It explores studies and case examples that demonstrate how 3D visualization enhances the customer experience, improves sales performance, reduces product returns, and streamlines the design and manufacturing processes. The section also highlights the positive impact of 3D visualization on customer engagement, brand perception, and competitive advantage.

3.5 Challenges

While 3D visualization offers numerous advantages, this section explores the challenges and considerations that furniture companies may encounter during its implementation. It discusses issues related to technological infrastructure, skill requirements, cost implications, and data management. The review also explores the potential limitations and drawbacks of 3D visualization, including user experience concerns and the need for ongoing software updates

Chapter 4

CASE STUDY

Introduction:

This chapter presents case studies of furniture companies from around the world that have successfully implemented 3D visualization technology. These case studies provide practical examples of how incorporating three-dimensional views of furniture products has benefited companies in terms of sales growth, customer satisfaction, and operational efficiency. By examining these real-world examples, valuable insights can be gained for furniture companies in Bangladesh considering the adoption of 3D visualization.

Case Study 1: IKEA

IKEA is a leading furniture manufacturer based in a European country. The company integrated 3D visualization technology into its online platform, allowing customers to interact with furniture products in a virtual environment. The implementation resulted in a significant increase in online sales, as customers were able to visualize the furniture's design, color options, and various configurations. The 3D visualization also reduced the number of product returns, as customers had a clearer understanding of the furniture's dimensions and appearance before making a purchase. Overall, the implementation of 3D visualization enhanced the customer experience, improved sales performance, and established IKEA as an innovative and customer-centric brand.

IKEA is among the earliest businesses that started using 3D and AR technology in their marketing strategy. Back in 2017, IKEA introduced its AR app, called IKEA Place. With it, users can virtually place true-to-scale 3D models in their homes before purchasing. Company's online sales increased by 43%; 2019, the company reached \$40 billion annual revenue worldwide. A part of that is associated with increased online sales. Being an early and successful adopter of AR technologies, IKEA is an excellent example to other ecommerce brands to start implementing the latest technologies in their

Case Study 2: Wayfair

Wayfair is a furniture retailer operating in a large North American market. Seeking to differentiate itself from competitors, the company introduced augmented reality (AR) technology to its mobile app. Customers could now virtually place furniture pieces in their own living spaces using their smartphones or tablets. This interactive and immersive experience significantly increased customer engagement, leading to higher conversion rates and customer satisfaction. Wayfair also observed a decrease in product returns, as customers were more confident about their purchase decisions after experiencing the furniture in their own environments. The successful implementation of AR-based 3D visualization helped Wayfair establish a strong online presence and drive sales growth. 33% increase in their conversion rate for strollers; and a 21% increase in visitors' average time spent on the brand's online shop. Marketing strategy.

The company's CEO Juergen Schuster admits that even though their products are stylish and appealing, they are also large. Therefore, marketing them through 2D images was not enough. To solve this issue, Garten und Freizeit started implementing 3D visualization technology, and soon their sales conversions increased up to 60%.

Case Study 3: Hatil

HATIL Furniture is one of the leading furniture manufacturers and retailers in Bangladesh. HATIL Furniture stands out in the industry by offering a 3D visualization feature for its furniture products. This feature allows customers to view and interact with furniture items in a virtual 3D environment. By leveraging advanced technology, customers can rotate, zoom in, and examine furniture pieces from various angles, providing a realistic and immersive experience. The 3D visualization feature offered by HATIL Furniture brings several benefits to customers. It enables them to visualize furniture items in their intended space, helping them make informed decisions about size, design, and placement.

CHAPTER 5

WORK PROCESS

5.1 Thought process

Defining Objectives: Clearly define the objectives and desired outcomes of implementing 3D visualization. This may include goals such as increasing customer engagement, reducing product returns, improving online sales conversions, or differentiating the brand from competitors.

Target Audience Analysis: Identify the target audience and their preferences, needs, and expectations. Understand their purchasing behavior, online browsing habits, and the factors that influence their buying decisions related to furniture products.

Market Trends and Competitor Analysis: Stay informed about the latest market trends in the furniture industry, particularly regarding the use of 3D visualization. Analyze how competitors are leveraging this technology and identify opportunities for differentiation and innovation.

Customer Pain Points: Identify the pain points that customers face when shopping for furniture, such as uncertainty about product fit, color accuracy, or design variations. Explore how 3D visualization can address these pain points and provide solutions that enhance the customer experience.

Value Proposition: Determine the unique value proposition that 3D visualization can offer to customers. Consider the ways in which it can improve their decision-making process, provide a realistic representation of products, and enable customization options.

Feasibility Assessment: Assess the feasibility of implementing 3D visualization within the existing infrastructure, considering factors such as available resources, budget, technological requirements, and potential challenges. Evaluate whether the benefits outweigh the costs and potential risks.

Innovation and Creativity: Encourage creative thinking and innovation in utilizing 3D visualization. Explore new ideas, concepts, and approaches that can differentiate the company and create a unique selling proposition in the market.

5.2 Pre-Production

We identify the desired level of detail, such as material textures, finishes, and functionality that should be accurately represented in the visualizations. We collect comprehensive information about the furniture products to be visualized. This includes dimensions, materials, colors, available configurations, and any other relevant details. We develop a content schedule or timeline that outlines the key milestones and deadlines for the pre-production phase. Then we allocate sufficient time for collecting product information and creating 3D models.

Develop 3D Models:

We generate 3D models based on the collected product information. This can be done by us. We ensure that the 3D models accurately represent the dimensions, shapes, and details of the furniture products.

Texturing and Materials:

Apply appropriate textures and materials to the 3D models to accurately represent the look and feel of the furniture.

Consider factors such as wood grains, fabric patterns, metal finishes, and other visual elements that contribute to the realism of the visualizations.

Quality Assurance:

Conduct thorough quality checks to ensure the accuracy and integrity of the 3D visualizations.

Verify that the dimensions, proportions, and details of the furniture products are accurately represented.

Test the visualizations on various platforms and devices to ensure compatibility and optimize

performance.

Finalize Pre-production Assets:

Prepare the finalized 3D models, textures, lighting setups, and other assets for the production phase.

Ensure that all necessary files and documentation are organized and easily accessible for the production

5.2.1 Survey Question

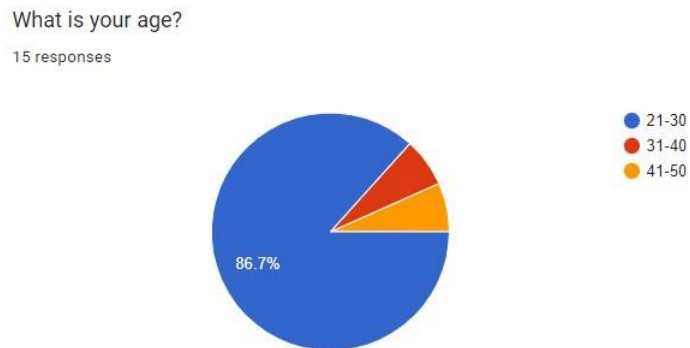


Figure 5.2.1.1: Survey result about age

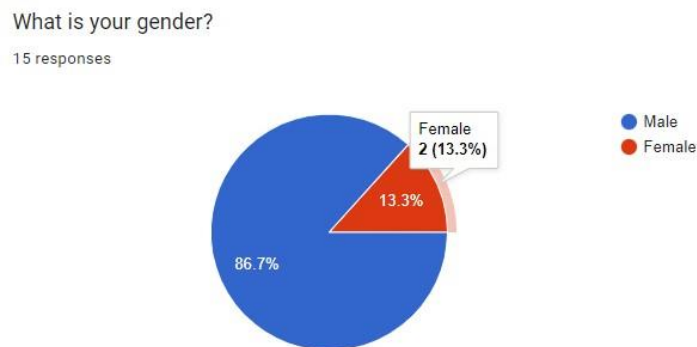


Figure 5.2.1.2: Survey result about gender

What is your occupation?

15 responses

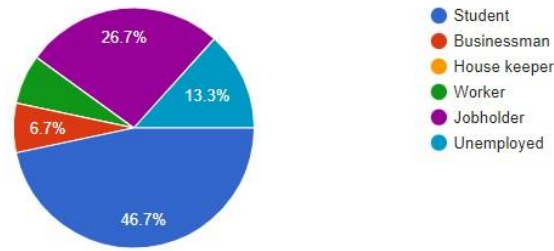


Figure 5.2.1.3: Survey result occupation

How familiar are you with the concept of 3D visualization in the furniture industry?

15 responses

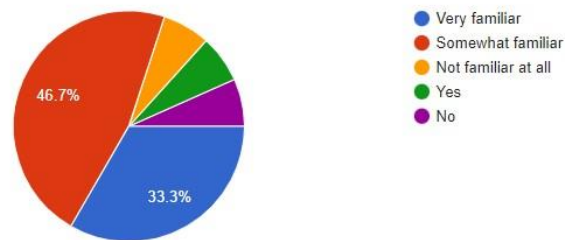


Figure 5.2.1.4: Survey result about familiar with the concept of 3D visualization

Have you ever used or experienced 3D visualization when exploring or purchasing furniture products?

15 responses

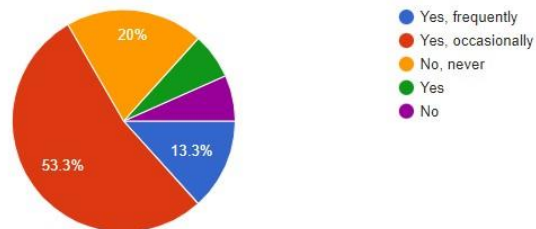


Figure 5.2.1.5: Survey result about user experience

In your opinion, how does 3D visualization contribute to reducing product returns?



12 responses

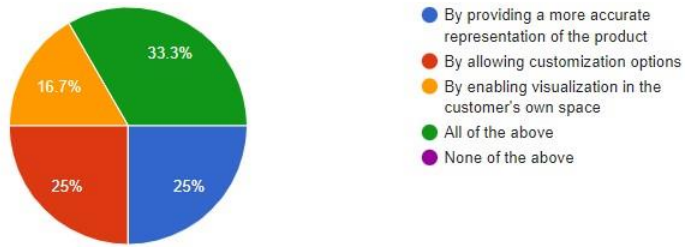


Figure 5.2.1.6: Survey result about user opinion

How important is 3D visualization in improving customer satisfaction when shopping for furniture?

15 responses

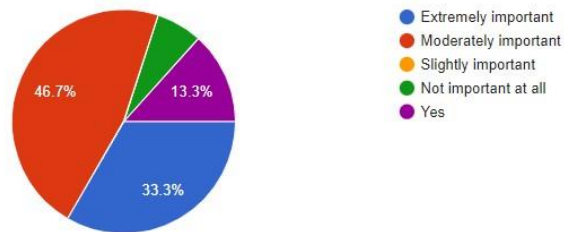


Figure 5.2.1.7: Survey result about importance for customer satisfaction

How likely are you to purchase furniture online if 3D visualization is available?

15 responses

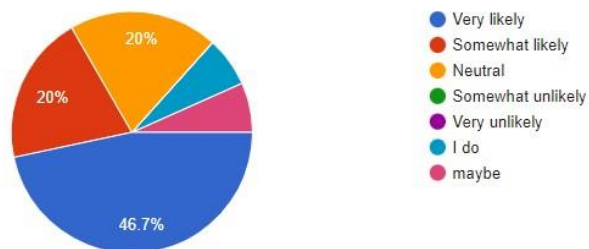


Figure 5.2.1.8: Survey result about how likely user to purchase furniture

How important is it for furniture companies in Bangladesh to adopt 3D visualization technology?
15 responses

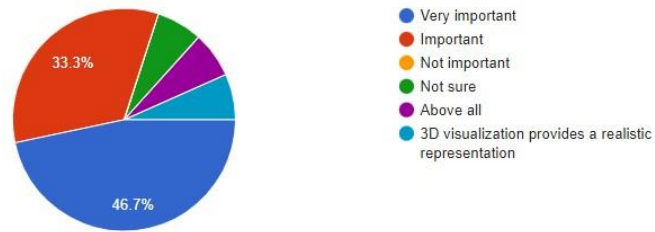


Figure 5.2.1.9: Survey result about how 3D visualization technology importance in Bangladesh

Are you interested in using augmented reality (AR) or virtual reality (VR) technologies to visualize furniture products in your own space?
15 responses

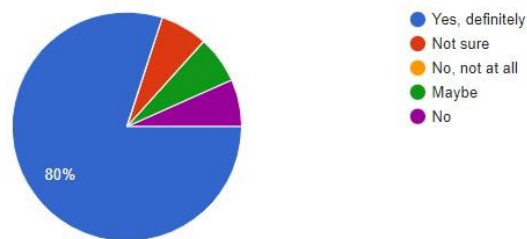


Figure 5.2.1.10: Survey result about user interested or not in using (AR) (VR) technologies in furniture products

5.2.2 Idea Generation

Considering the furniture that is most used in home and office in Bangladesh, we have selected those types of furniture for our project. Our objective is to present people who are connected to the online world and who are comfortable shopping online in their busy lives with a real photo realistic view of their purchased products. So that they can see their product in 360 degree view or three dimensional view. Get the right idea about the product, online customer engagement will increase, our selected furniture is Almira, Sofa, Chair, Table, Bed, Side table, Center table, TV cabinet etc.

5.2.2 Collect Reference

As per my idea, I try to collect the reference from internet. I search photos and videos in Google, YouTube, Pinterest, and Furniture websites. I collect the reference photos. And make a clear idea about my furniture design.

5.2.3 Analysis

Material: From our user research part, we came to know that most people like the wooden furniture. A well-made piece of wood furniture has strength and durability, especially when it is built of domestic hardwoods (use- Oak, Mehegoni, Akashmini). Furniture made of solid wood is classic, durable, and designed to survive for many decades or even centuries.

Size: After analysis Bangladeshi furniture size, we try to design all my furniture like our traditional comfort furniture. We mention the furniture dimension in feet.

1. **Modern Bookcase:** Width: (shelf – 4’), Length: 10’’, Height: 4’
2. **Almira:** Width: 5’, Length: 1.5’, Height: 7’
3. **Tea Table:** Width: (1.5’) (, Length: (3.5’) , Height: (1.5’)
4. **Bed:** Width: (5’) , Length: 7’ , Height: (1.3’)
5. **Sofa:** Width: (2’) , Length: (6’) , Height: (1.2)

Cost: The cost list will vary depending on the material, design, and measurements. I made the list by discussing with the carpenter.

1. **TV wall cabinet:** Thirty Thousand Taka
2. **Storage bed:** Forty Thousand Taka
3. **Bookcase:** Eight Thousand Taka
4. **Sofa:** Twenty six Thousand Taka
5. **Tea table:** Seven Thousand Taka

Design: I try to make the design mixes of our traditional furniture and modern minimalistic furniture. Therefore, the furniture will be familiar to the users and will have a modern vibe. It will be convenient to use them.

Software: I required some specific software and materials for my project. These are the programs, plugins, and scripts I use.

Autodesk 3ds Max 2020

A professional 3D computer graphic tool called Autodesk 3ds Max is used to create 3D models, animations, games, and image visualizations. Other names for it include 3D Studio and 3D Studio Max. Along with versatile plugin architecture, it provides modeling capabilities. It is frequently used by companies that create video games, several TV commercial studios, and architectural visualization companies.



Figure 5.2.3:1: Logo of 3ds max

V-Ray

Chaos, a Bulgarian software business, created the biased rendering software program known as V-Ray. V-Ray is a for-profit plug-in for third-party 3D computer graphics software programs that is employed for computer graphics and visualizations in a variety of fields, including media, entertainment, film and video game development, industrial design, product design, and architecture.



Figure 5.2.3:2: V-ray for 3ds max

Autodesk MAYA

A 3D computer graphic program called Maya is employed in the creation of animated movies, TV shows, video games, and other visual effects. This software's ability to produce large models enables us to provide Ultra 3D effects that render a realistic view for the user. Autodesk Maya is the abbreviated form of the full name. Originally developed by "Alias Systems Corporation," Autodesk now owns full rights to the software. Additionally, it functions on Linux, Mac OS, and Windows. [21]



Figure 5.2.3:3: logo of Autodesk Maya

Rizom UV 2022

A software program called Rizom UV is used to produce and edit UV maps for 3D objects. A crucial step in the texturing process for 3D graphics, UV maps are used to map a 3D model's surface to a 2D texture.

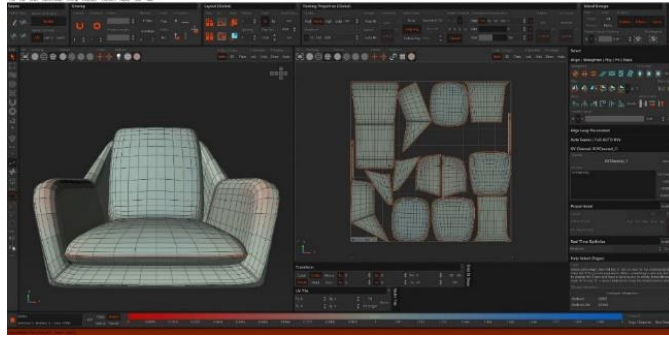


Figure 5.2.3:4: Rizom UV interface

Substance Painter

For 3D experts and aficionados, Adobe Substance 3D Painter is the go-to texturing software. Because of Painter's unmatched speed, flexibility, and visual quality, the industry relies on it to bring its creations to life

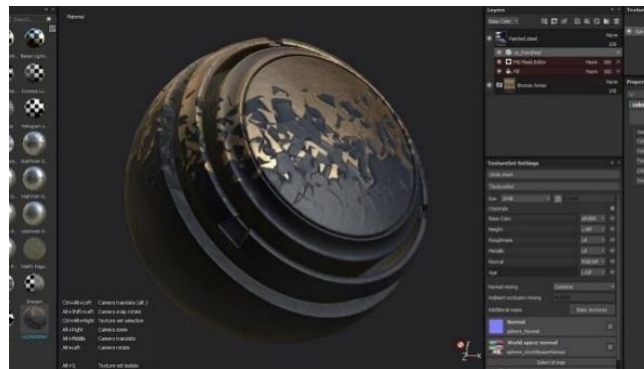


Figure 5.2.3:5: Substance Painter interface

5.2.4 Sketch

I sketched the entire furniture base and add the measurement. I've included my hand-drawn illustration below.

1. G Shape :

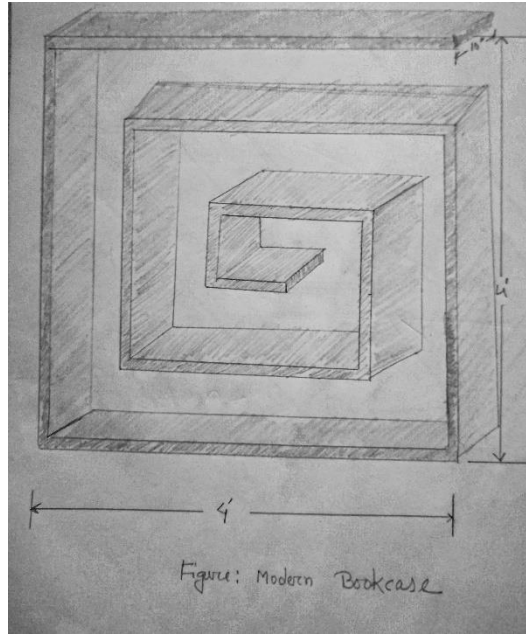


Figure 5.2.4:1: Sketch of Bookcase

2. Storage bed:

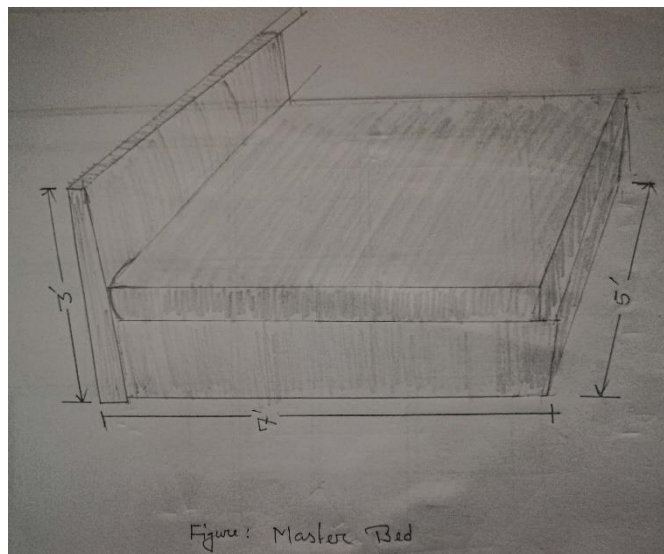


Figure 5.2.4:2: Sketch of Tea Table

3. Cube shape table:

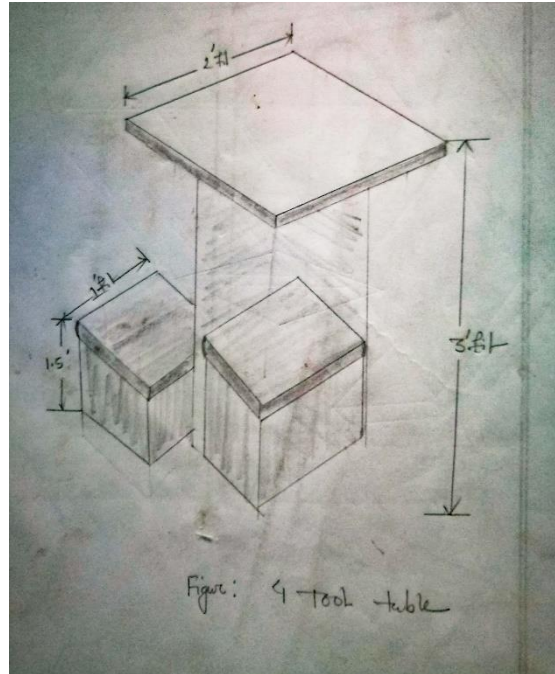


Figure 5.2.4:3: Sketch of Squire Table

4. Storage dressing table:

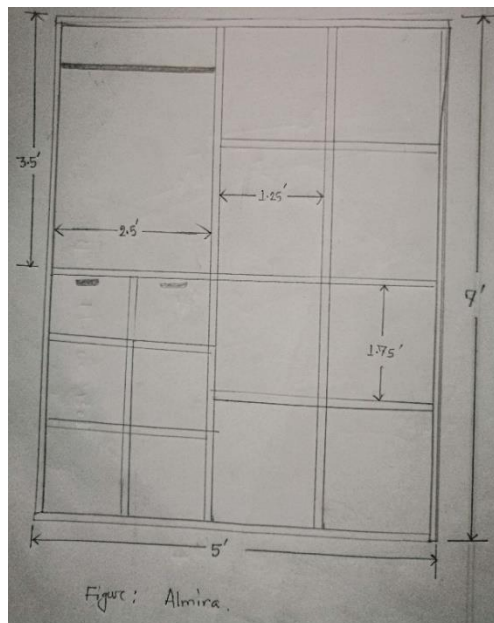


Figure 5.2.4:4: Sketch of Almira

5. Tea table:

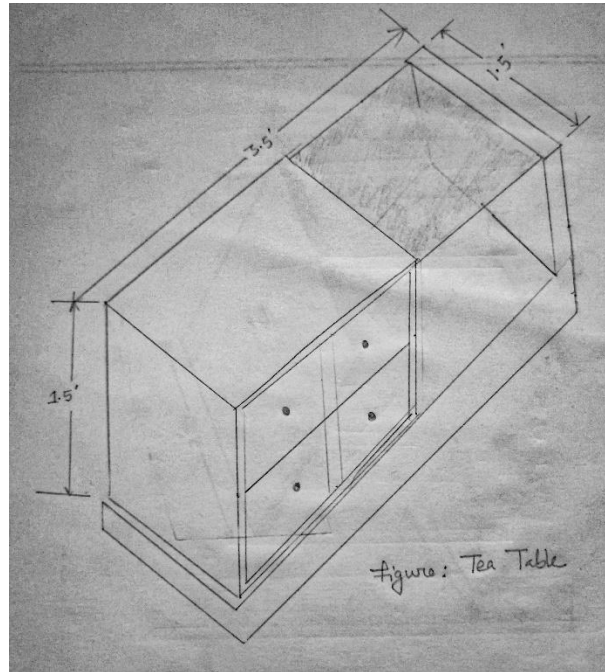


Figure 5.2.4:5: Sketch of Tea Table

5.2.5 Project Timeline

We made a Gantt chart for our project timeline.

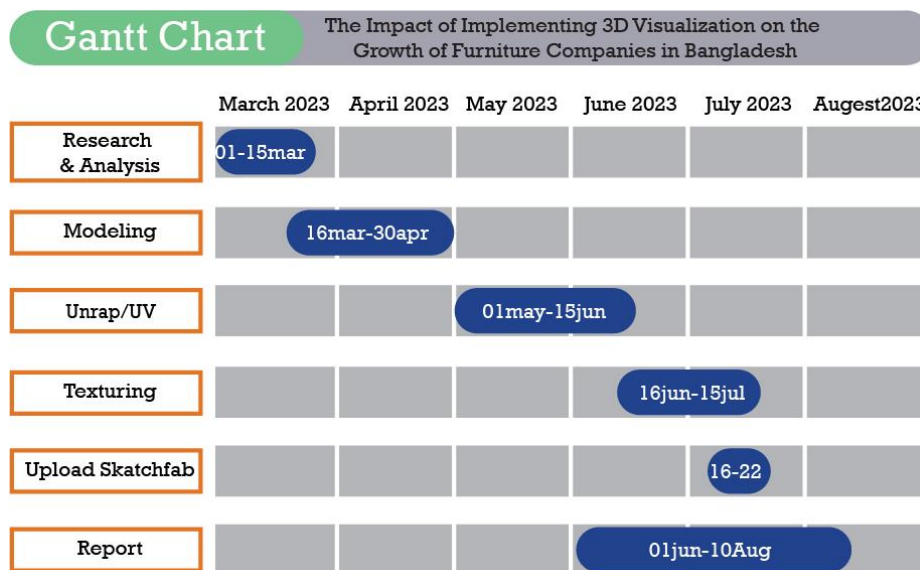


Figure 5.2.5:1: Gantt chart for project timeline

5.3 Production

We began working on my project's production after the pre-production phase. Below, we've provided a description of one furniture's entire production process.

5.3.1 Modeling

We gather reference images and sketches of the entire product. This helps us understand the dimensions, proportions and details of the model.

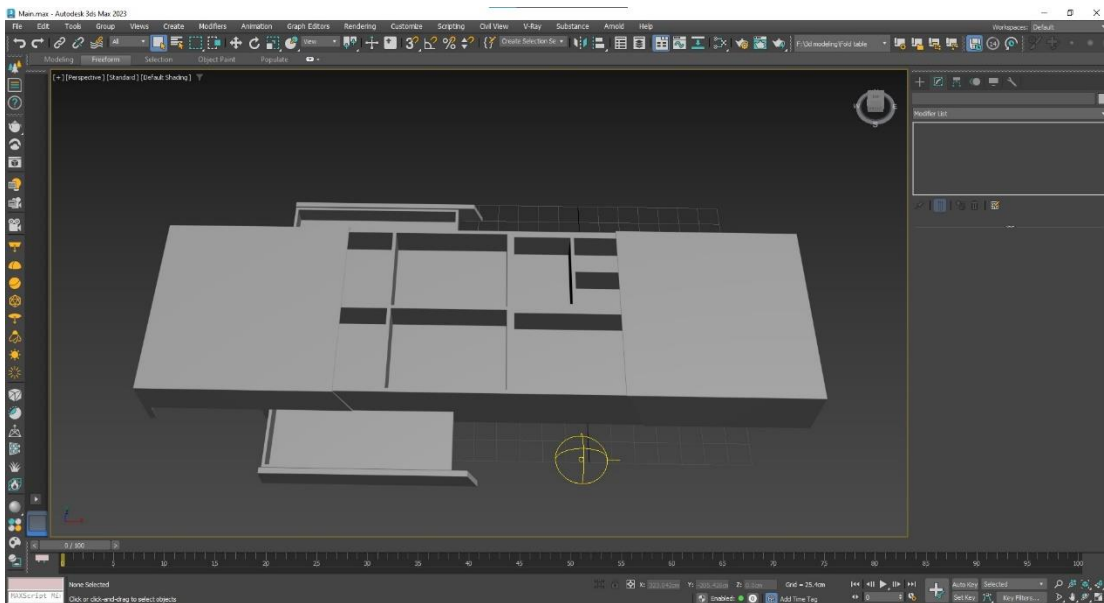


Figure 5.3.1.1: 3Ds Max view all parts of the table

1.Start a New Project: Launch Autodesk 3ds Max and start a new project to work in.

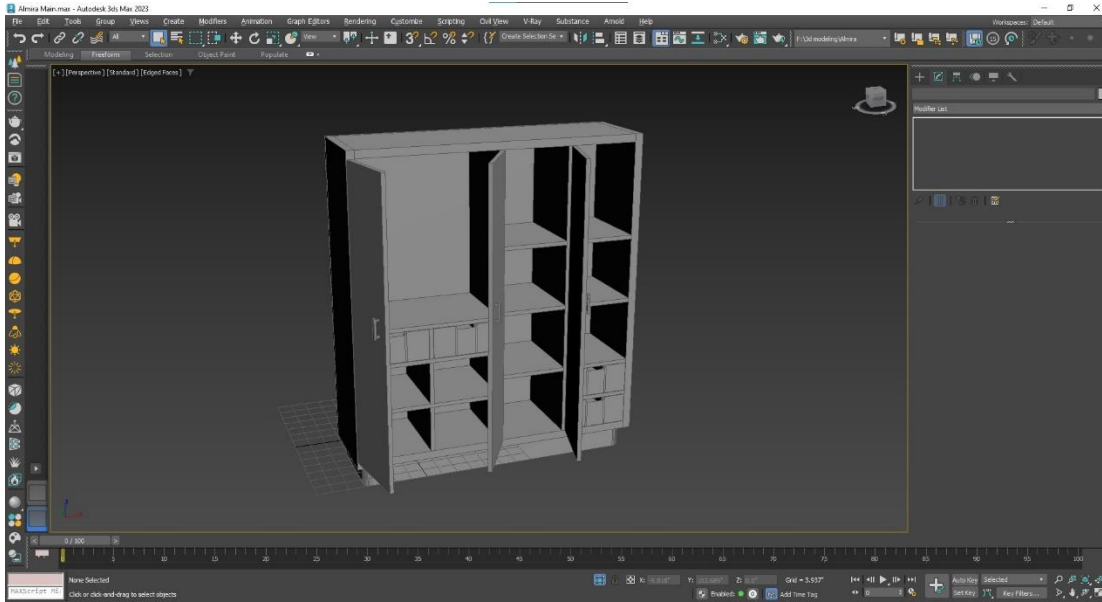


Figure 5.3.1.2: 3Ds Max view of Almira

2. Set Up Units: Configure the units of measurement according to your preference or the specifications provided in the reference images.

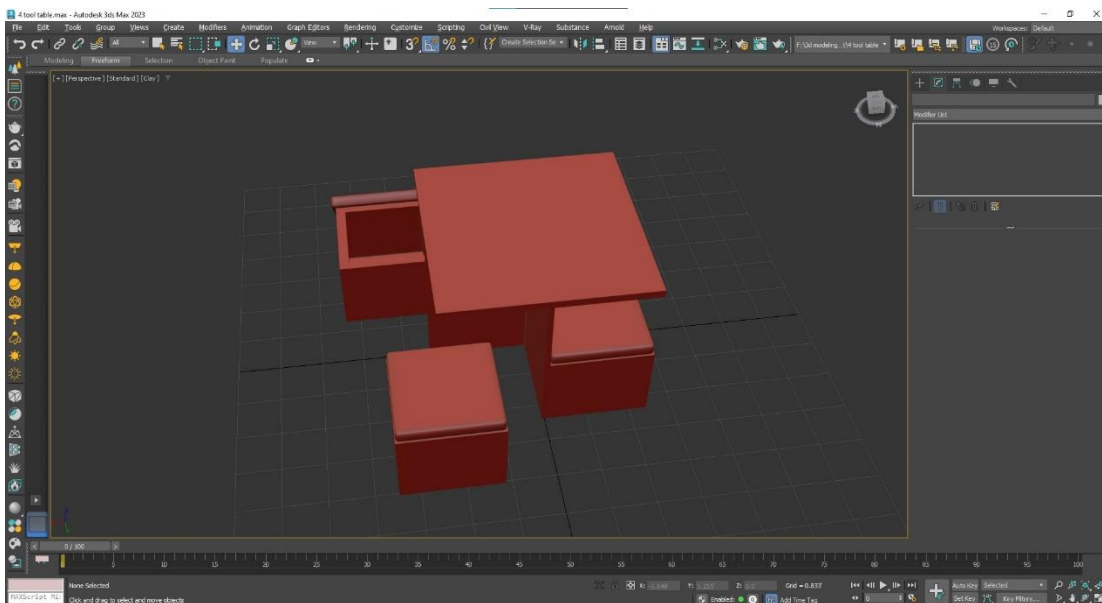


Figure 5.3.1.3: 3Ds Max view of the squire shape table

3. Create a Base Shape: Begin by creating a base shape that represents the overall form of the furniture. Use the reference images to guide you in creating the correct size and shape.

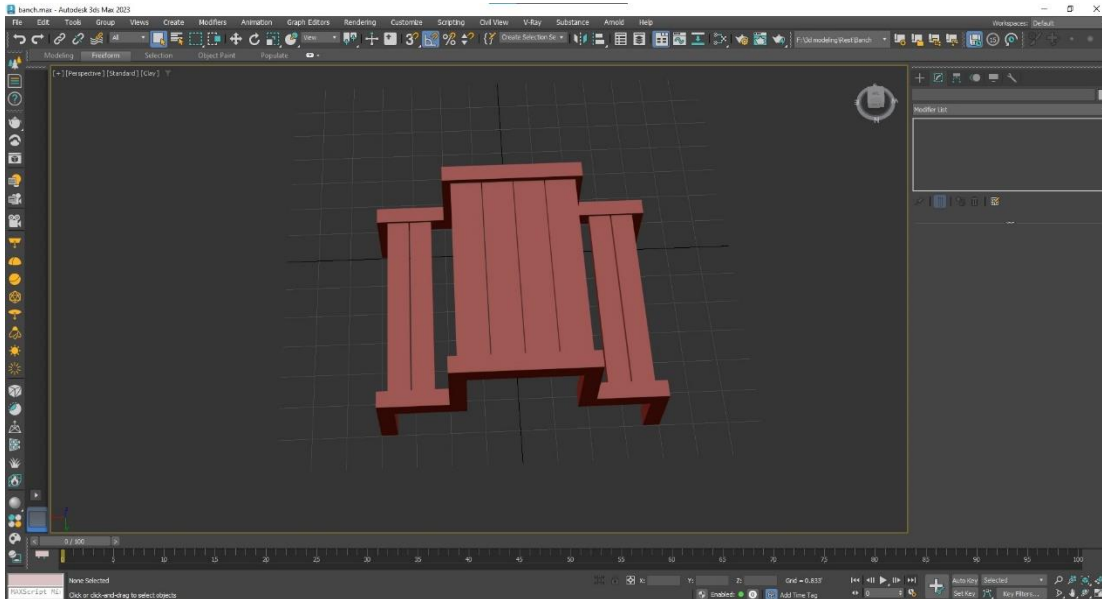


Figure 5.3.1.4: 3Ds Max view of the Bench

4. Modify the Shape: Use various modeling tools and techniques in 3ds Max to modify the base shape and add details to match the reference images. This can include using tools like Extrude, Bevel, Chamfer, and Cut to create edges, corners, and intricate details.

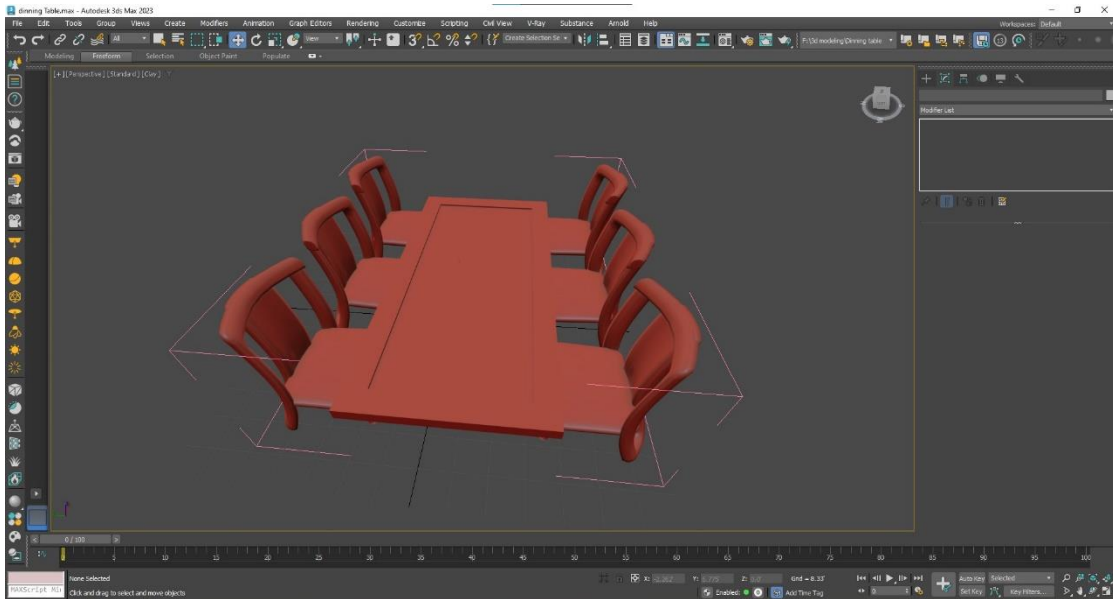


Figure 5.3.1.5: 3Ds Max view of the Dining table

5. Add other Features: Depending on the design of the furniture, we create and attach, supports, or other features. Use additional primitive objects or modify the existing shape to create these elements.

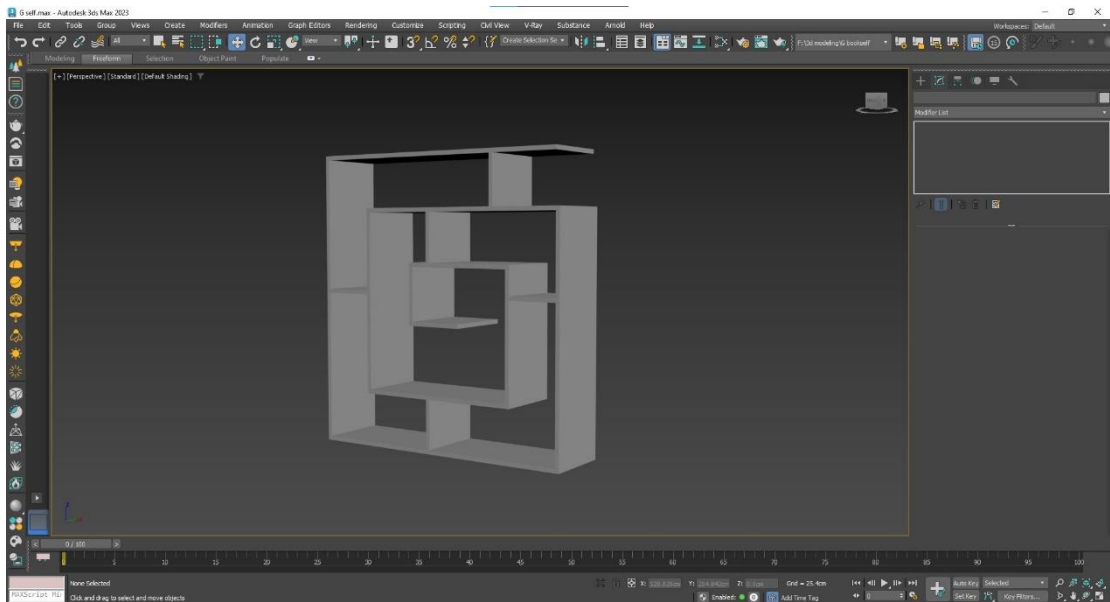


Figure 5.3.1.6: 3Ds Max view of the bookshelf

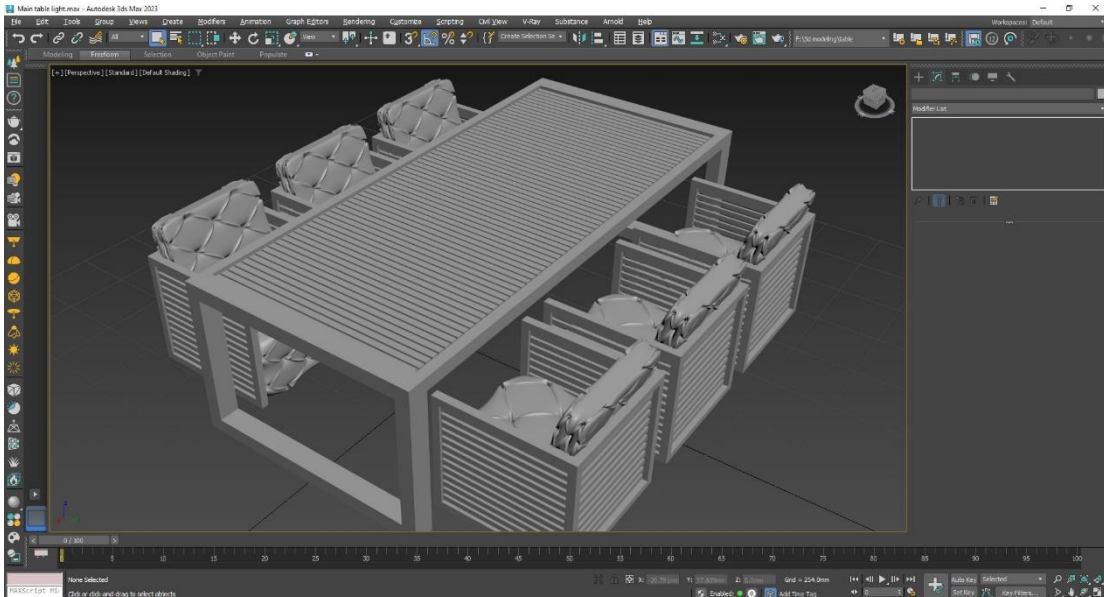


Figure 5.3.1.7: 3Ds Max view of the Sofa

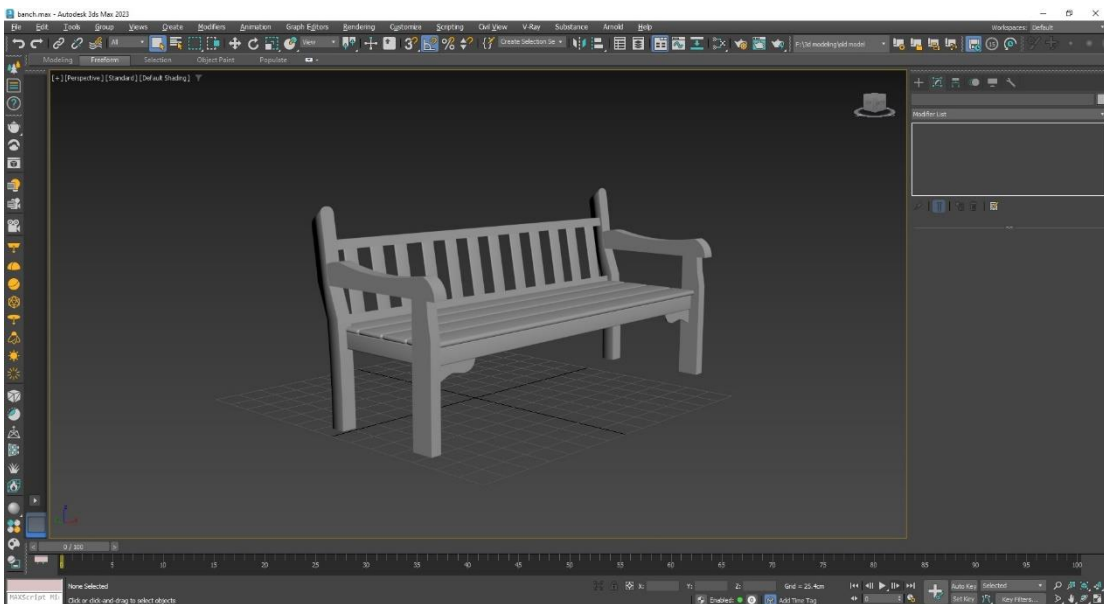


Figure 5.3.1.8: 3Ds Max view of the chair

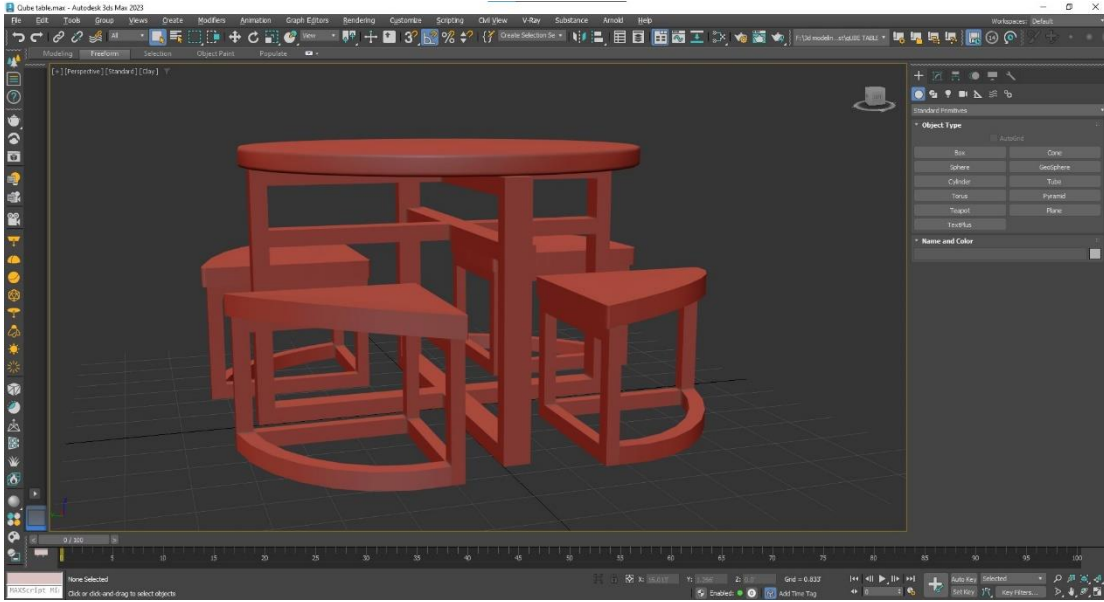


Figure 5.3.1.9: 3Ds Max view of the round table



Figure 5.3.1.10: 3Ds Max view of the TV table

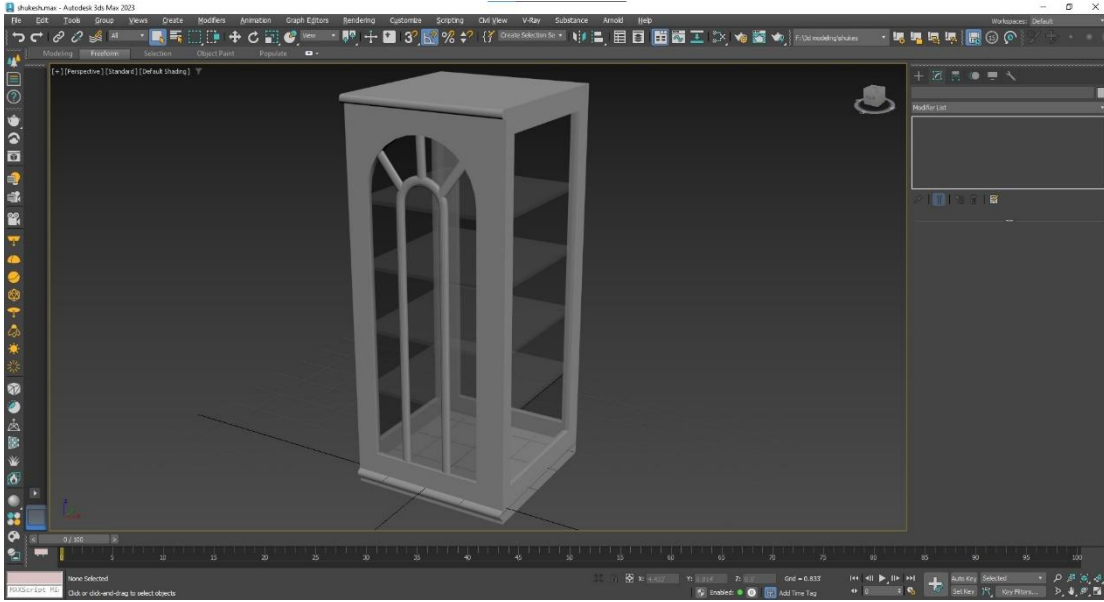


Figure 5.3.1.11: 3Ds Max view of the showcase

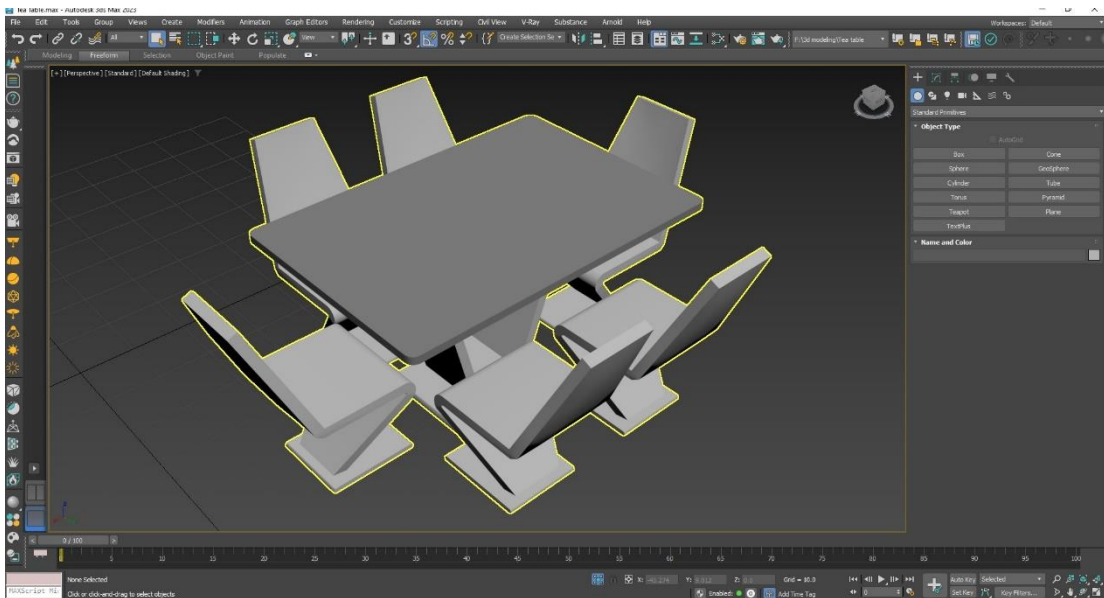


Figure 5.3.1.12: 3Ds Max view of the Dining table

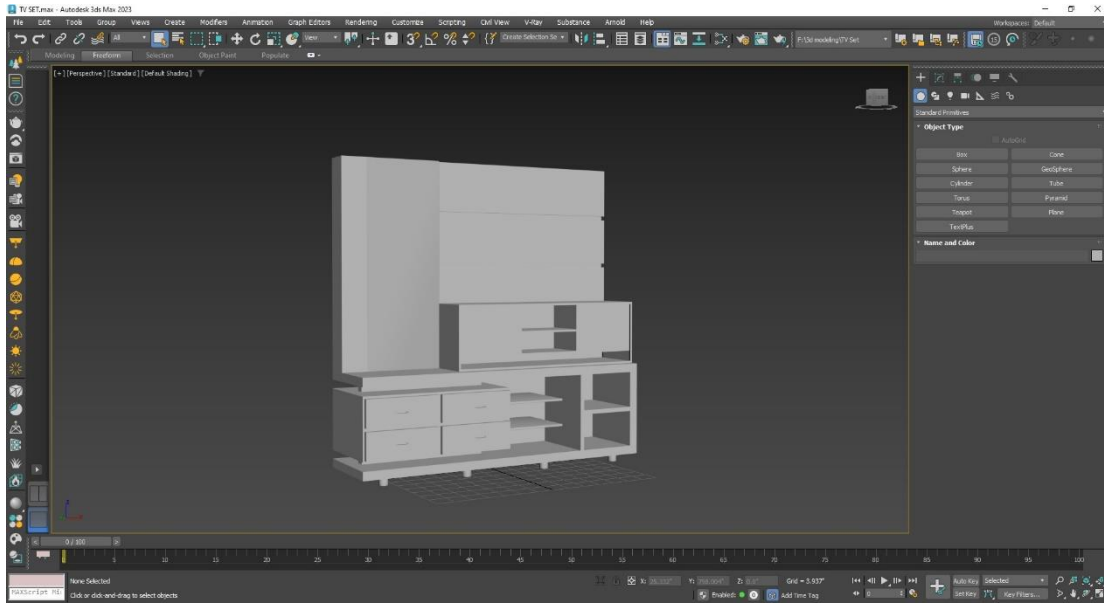


Figure 5.3.1.13: 3Ds Max view of the TV set

After assembling all the pieces, I tested how they appeared while the table was closed and open.

5.3.2 UVW

We used the Rizom UV software to create the UV. I completed the texturing with Substance Painter after finishing the UV. I add a wooden texture and set the parameter of every texture map to approximate a real wooden texture.

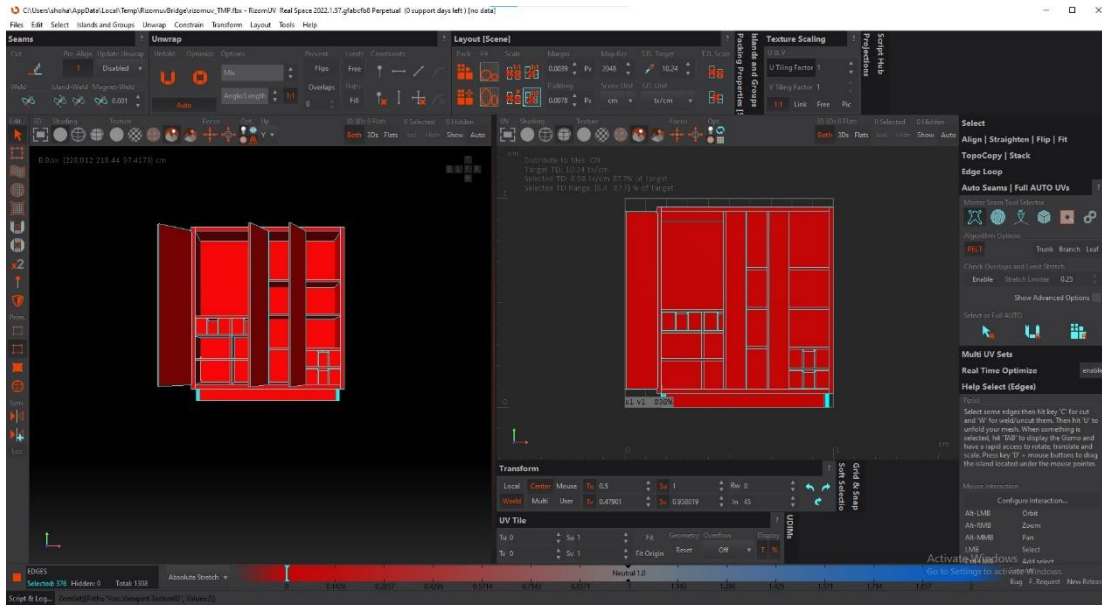


Figure 5.3.2.1: Unwrapped model on Rizom UV

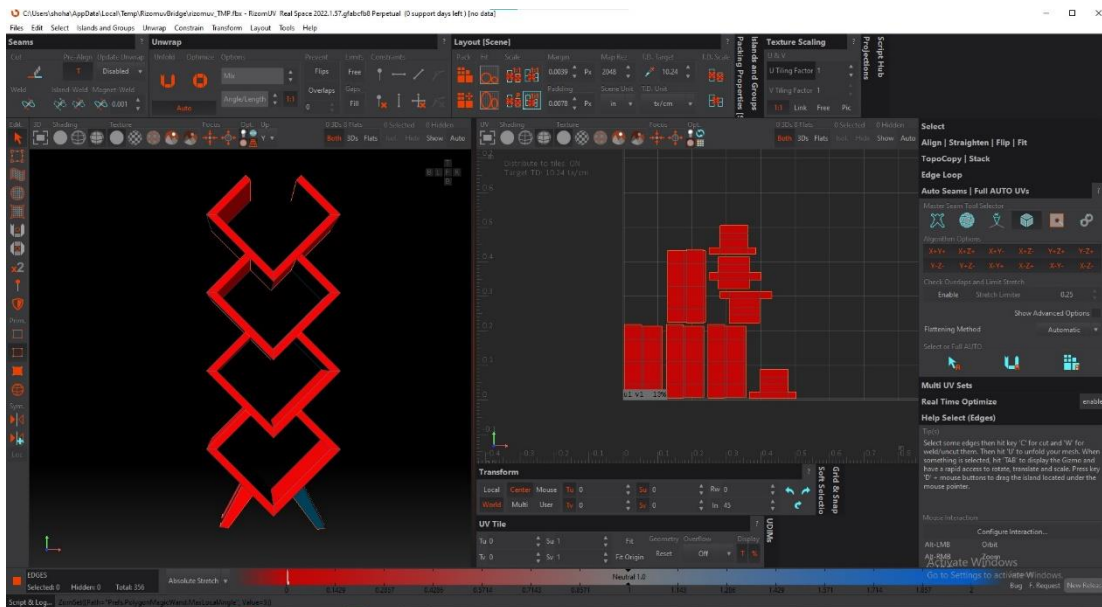


Figure 5.3.2.2: PBR texture sets of table

5.3.4 Lighting

To lighting furniture model in 3ds max, we follow these step-by-step instructions:

Set Up the Scene: Start by creating an interior scene in 3ds Max. Place the furniture model within the scene at the desired location.

Create Lights: To light the furniture, in 3ds Max, there are several types of lights we use, such as Omni light, Spot light, Direct light.

Position the Lights: We may want to use a spotlight to highlight specific details or a soft, diffused light for a more even illumination. Modify the properties of each light to fine-tune their appearance and behavior. Ensure that the furniture materials are properly configured to respond to the lighting in the scene.

Render the Final Image: Once we satisfied with the lighting setup, configure the rendering settings in 3ds Max according to your requirements. Adjust parameters like resolution, file format, and quality settings. Then initiate the rendering process to generate the final image or animation.

5.3.5 Rendering

To render a scene in 3ds Max using V-Ray, you can follow these step-by-step instructions:

Set up the Render Output Settings: We go to the Render Setup dialog by clicking on the Rendering menu and selecting Render Setup. In the Common tab, choose the desired image output format (e.g., JPEG, PNG) and set the image size/resolution.

Select the output location where the rendered images will be saved.

Configure V-Ray as the Renderer: In the Assign Renderer section, choose V-Ray as the Production renderer. Click on the "..." button next to V-Ray Renderer to open the V-Ray settings dialog.

Adjust V-Ray Render Settings: In the V-Ray settings dialog, numerous options to control the rendering process.

Start the Render: Click the Render button in the Render Setup dialog to start the rendering process.

Save the Rendered Images: Once the rendering is complete, we save the rendered images to the specified output location.



Figure 5.3.5.1: TV set render interface view in Autodesk 3ds Max



Figure 5.3.5.2: Dining table render interface view in Autodesk 3ds Max



Figure 5.3.5.3: Almira Render interface view in Autodesk 3ds Max



Figure 5.3.5.4: Showcase Render interface view in Autodesk 3ds Max

5.3.6 Final output

Simple table: Now our textured model ready to upload sketchfab. So we signup Sketchfab account.

Prepare Model: We export our model 3ds max file to obj formats. Our model is textured by adobe substance painter. And UV mapping by RizomUV.

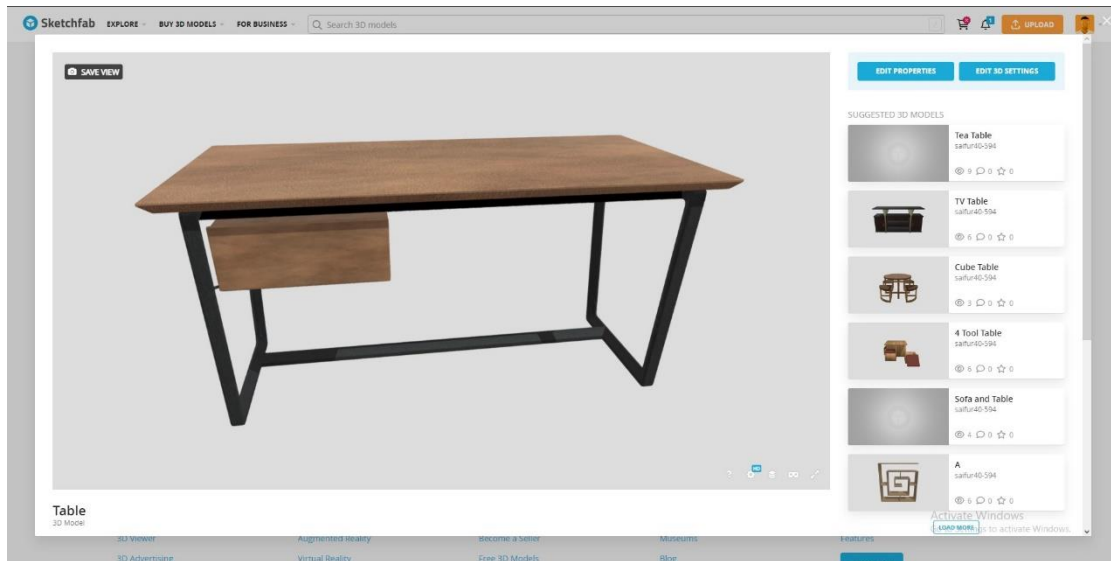


Figure 5.3.6.1: Table close view in Sketchfab

Start the Upload Process: Once signed in, click on the "Upload" button on the Sketchfab website's top navigation menu. We drag and drop our model file into the designated area on the upload page or use the file browser to select the file from our computer.

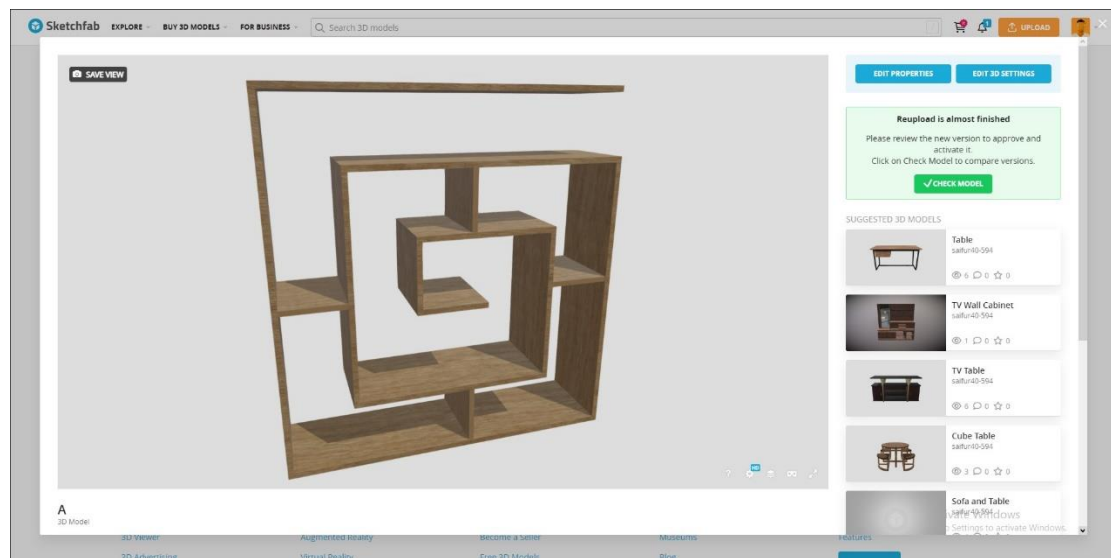


Figure 5.3.6.2: Bookshelf close to open view in Sketchfab

Configure Settings: We Fill in the required information for your model, including title, description, and tags. Provide a clear and concise description to help users understand our model.

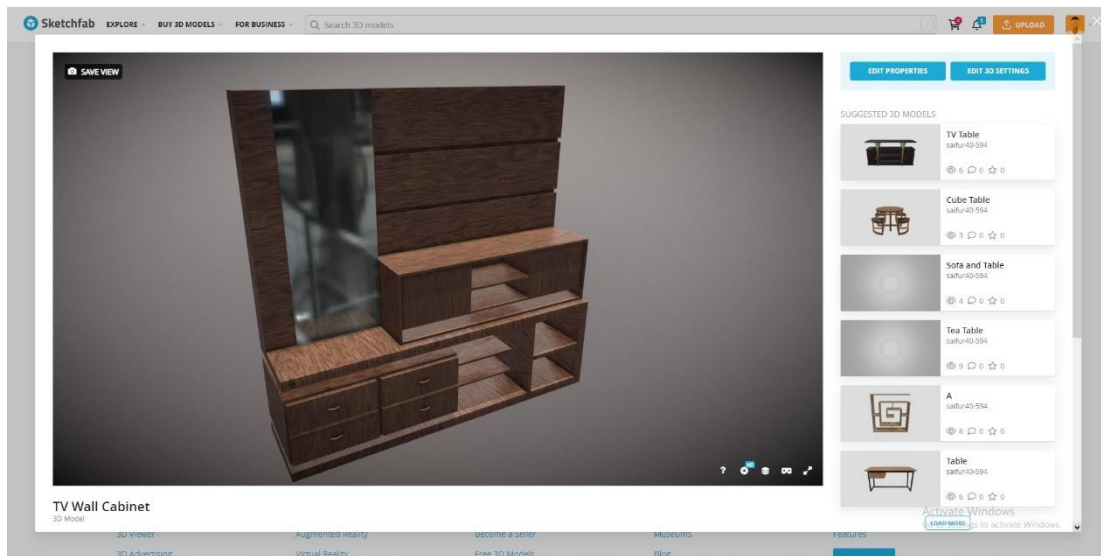


Figure 5.3.6.3: TV cabinet open view in Sketchfab

Publish Model: Then publish our model to sketchfab. Once the upload is complete, we'll be redirected to the model's page on Sketchfab. From there, we can view your model in 3D, explore it from different angles, and interact with it.

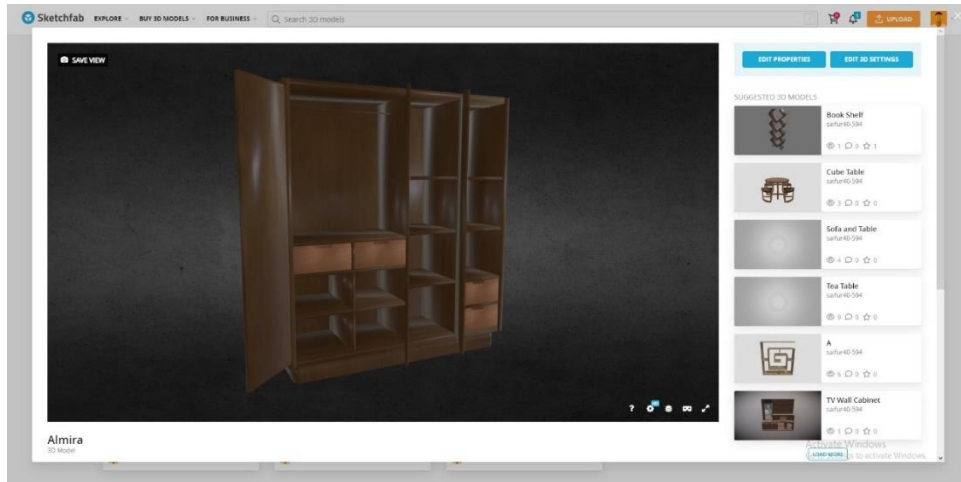


Figure 5.3.6.4: Almira close view in Sketchfab

Center Table:

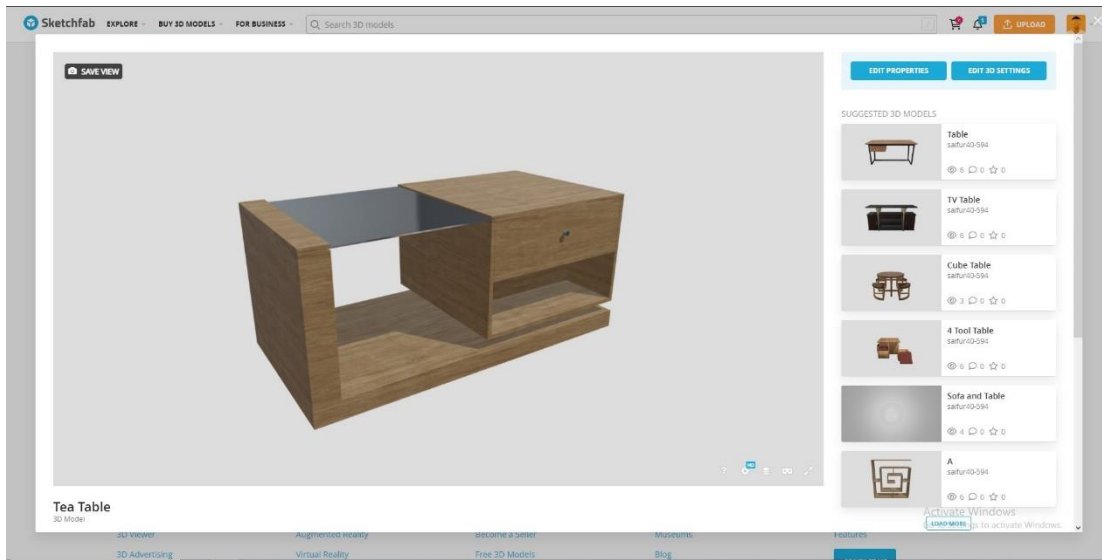


Figure 5.3.6.5: Center Table view in Sketchfab

Multiple Use Table:

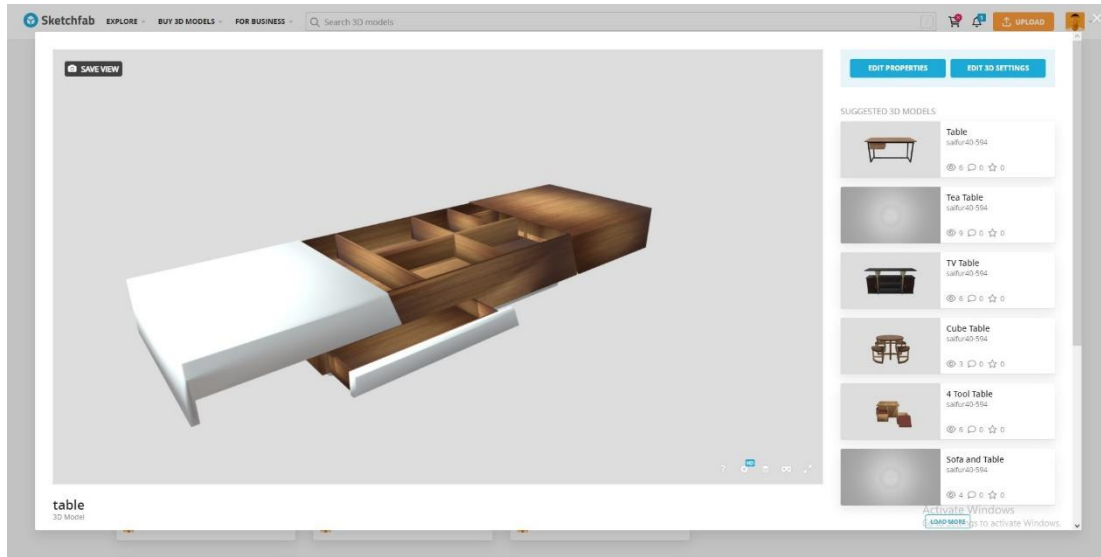


Figure 5.3.6.6: Multiple use of center table view in Sketchfab

Traditional Sofa:

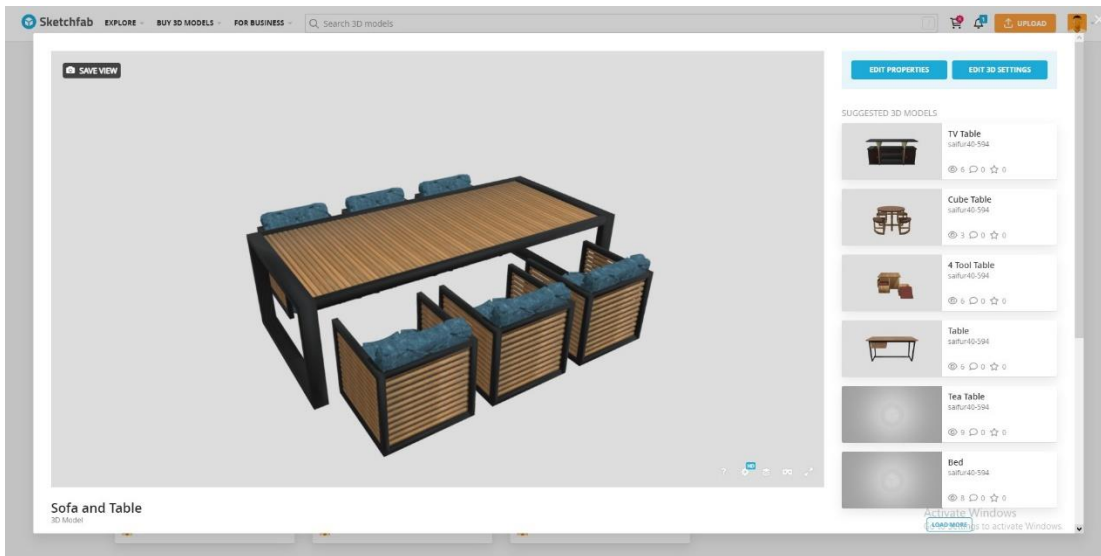


Figure 5.3.6.7: Traditional sofa and table view in Sketchfab

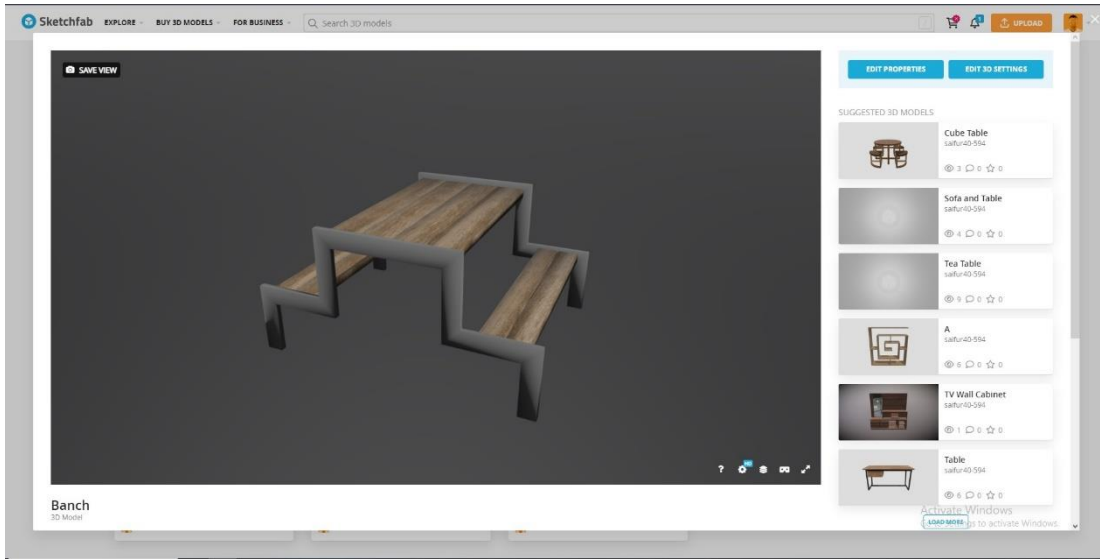


Figure 5.3.6.8: Bench and table view in Sketchfab

Round table:

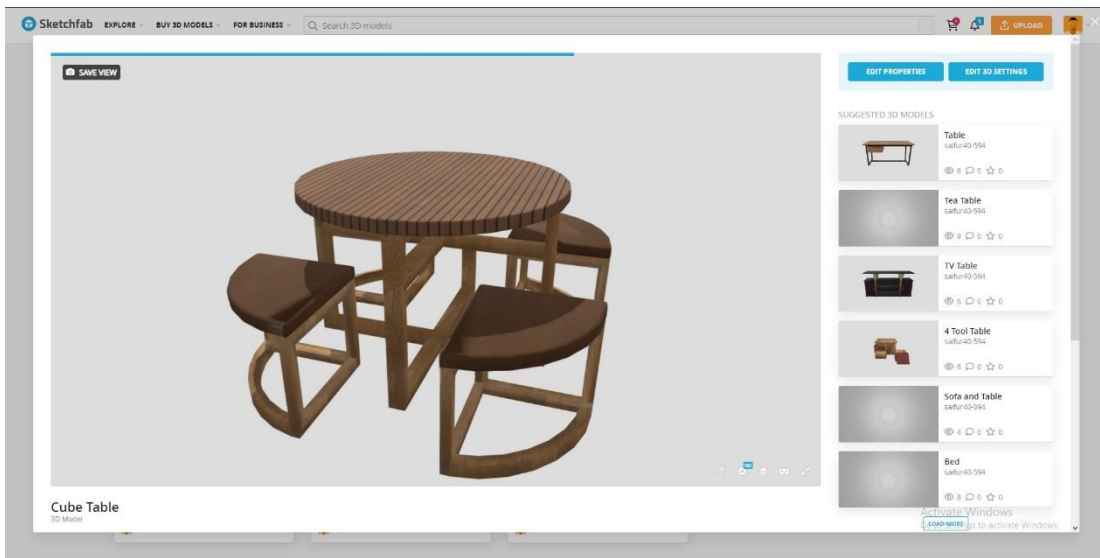


Figure 5.3.6.9: Round table and tool view in Sketchfab

Simple Reading Table:

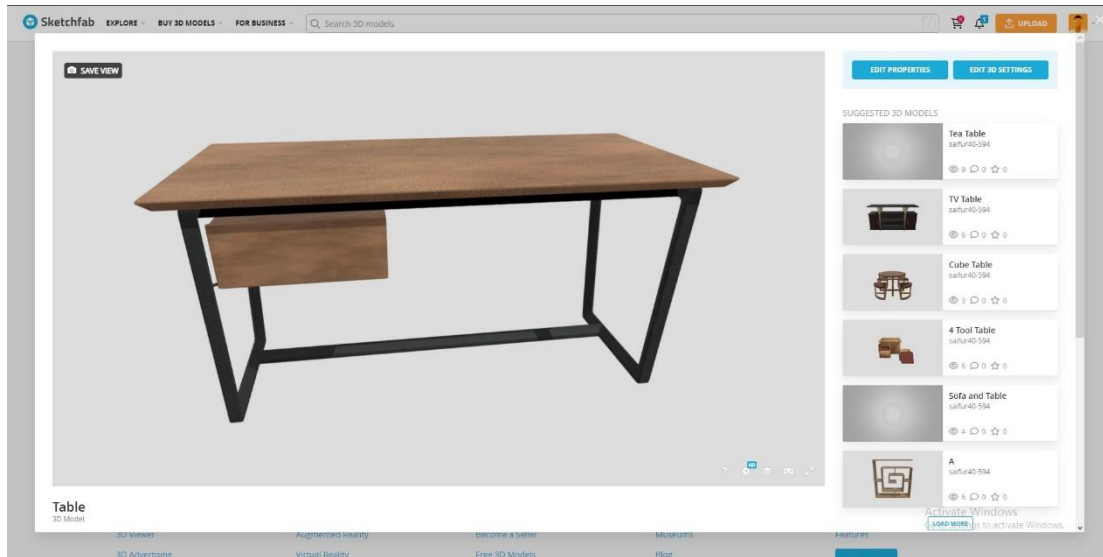


Figure 5.3.6.10: Reading table view in Sketchfab

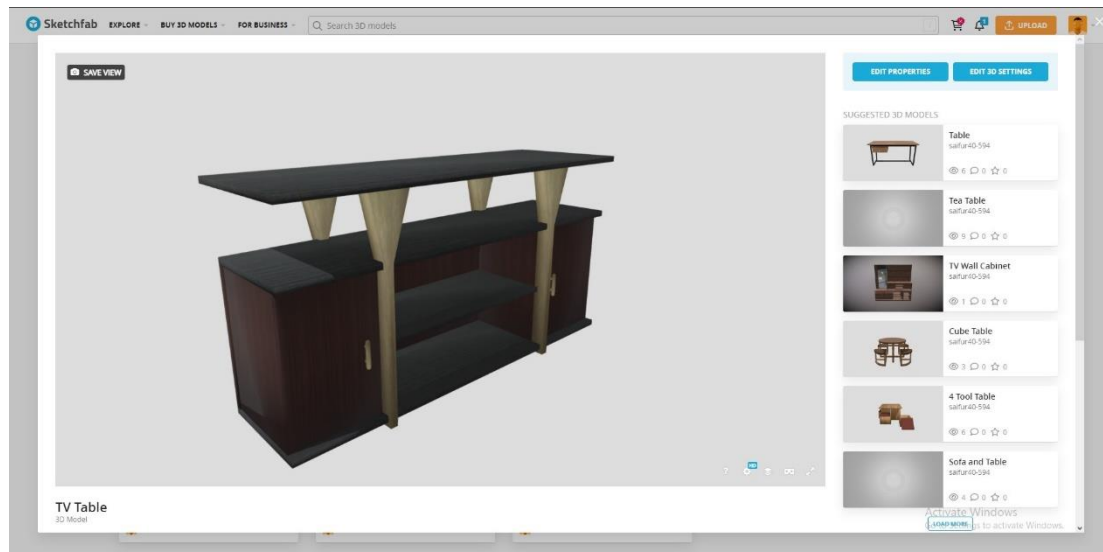


Figure 5.3.6.11: TV cabinet view in Sketchfab

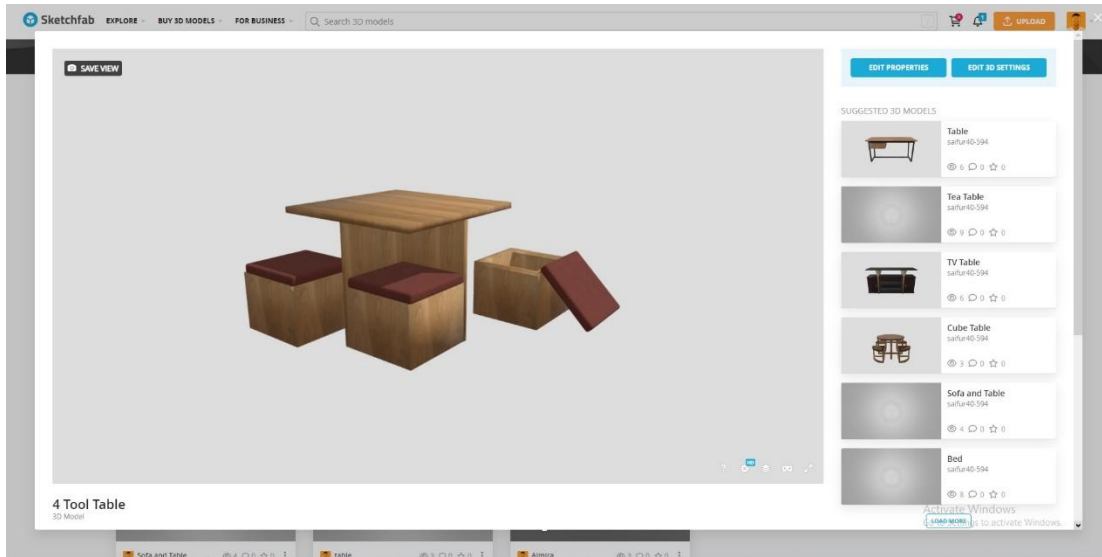


Figure 5.3.6.12: Squire shape table and tools view in Sketchfab

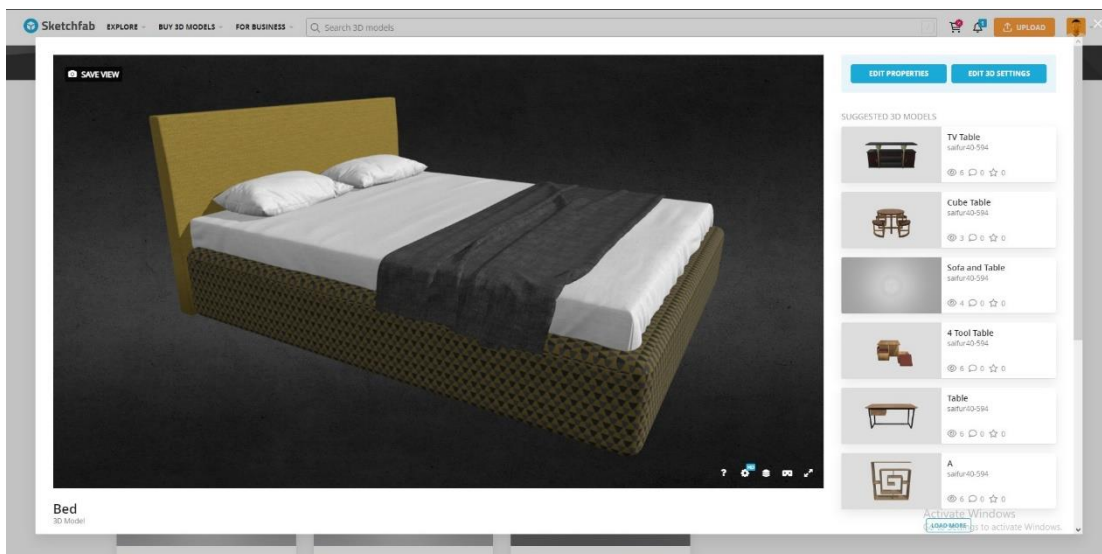


Figure 5.3.6.13: Single bed view in Sketchfab

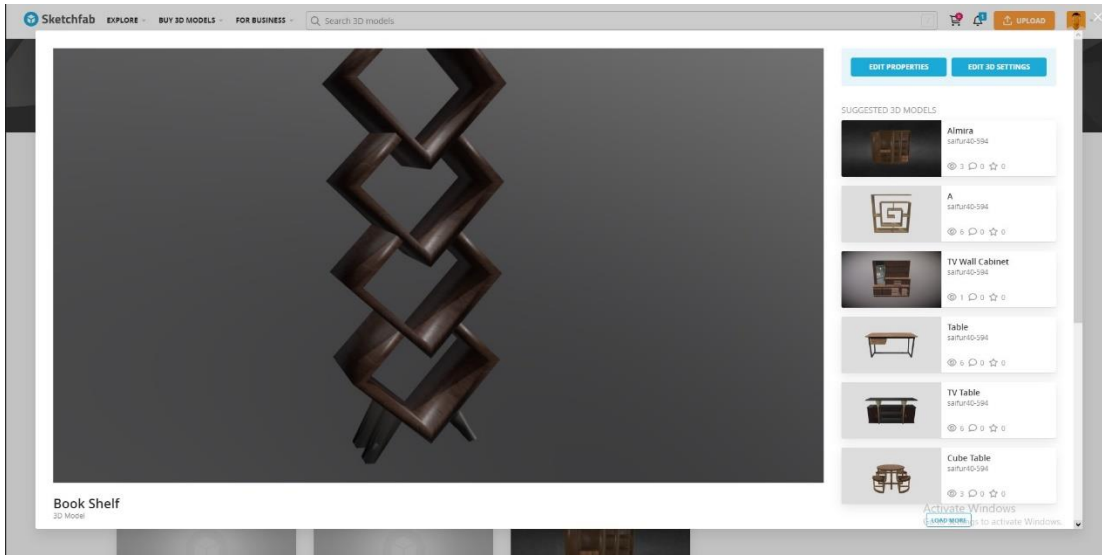


Figure 5.3.6.14: Bookshelf view in Sketchfab

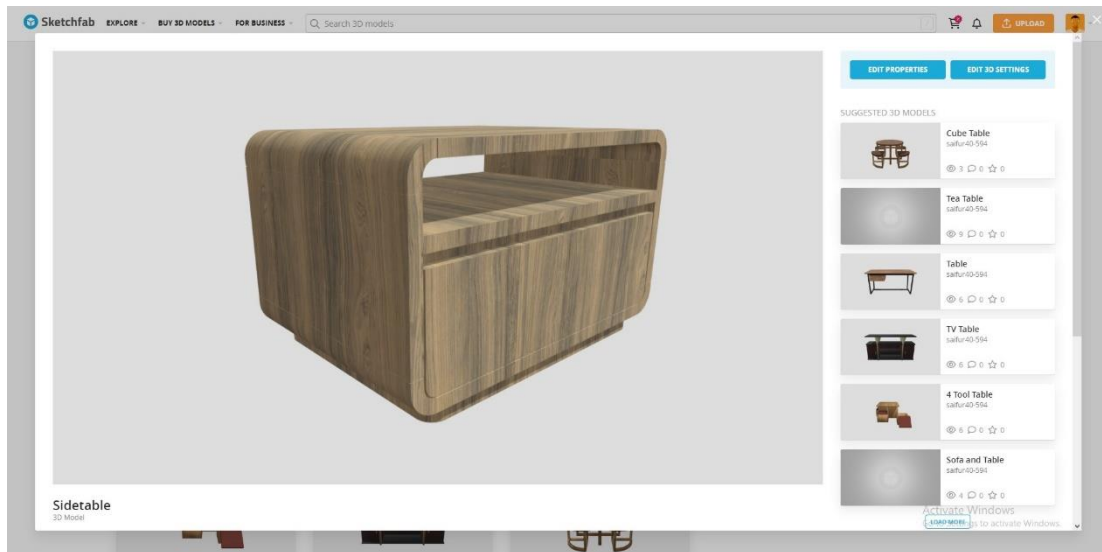


Figure 5.3.6.15: Bed side table view in Sketchfab

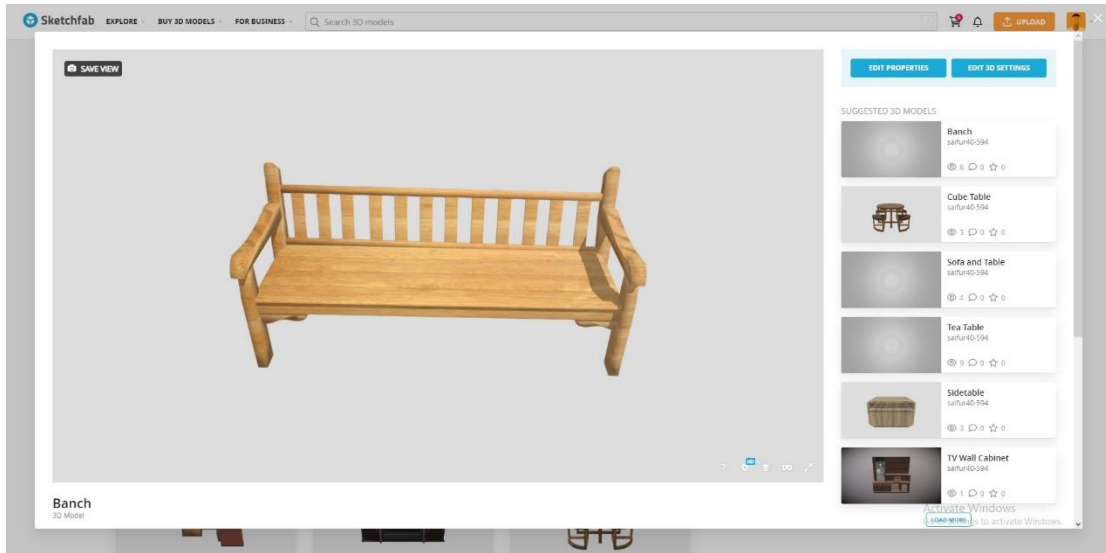


Figure 5.3.6.16: Traditional bench view in Sketchfab

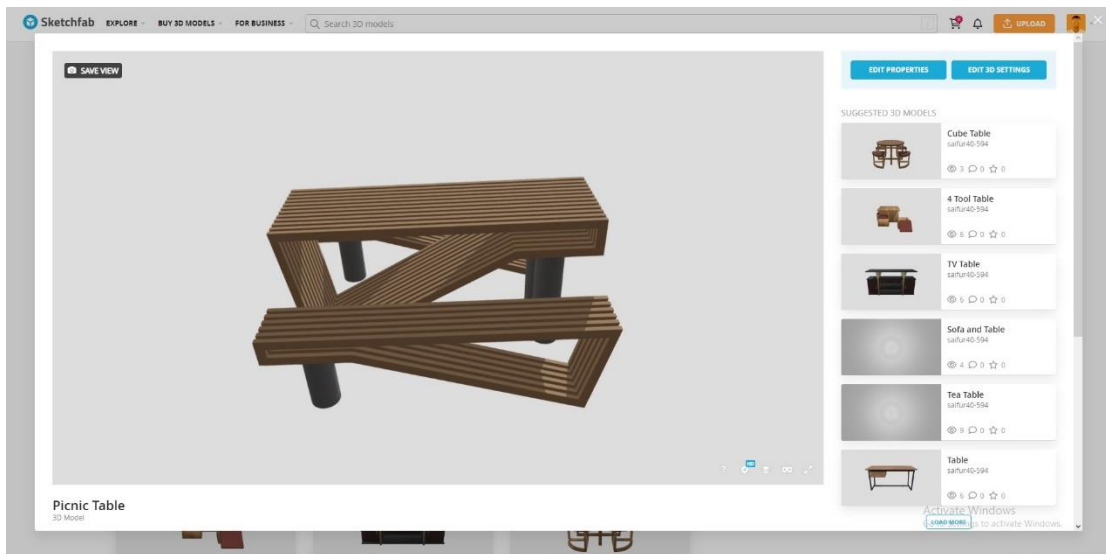


Figure 5.3.6.17: Park bench and table view in Sketchfab

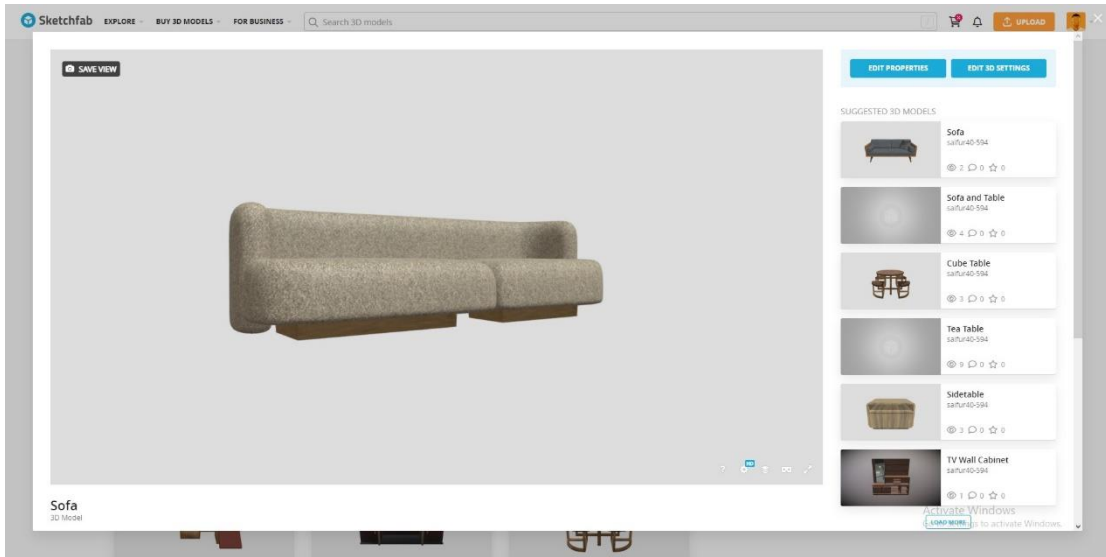


Figure 5.3.6.18: Minimalist sofa view in Sketchfab

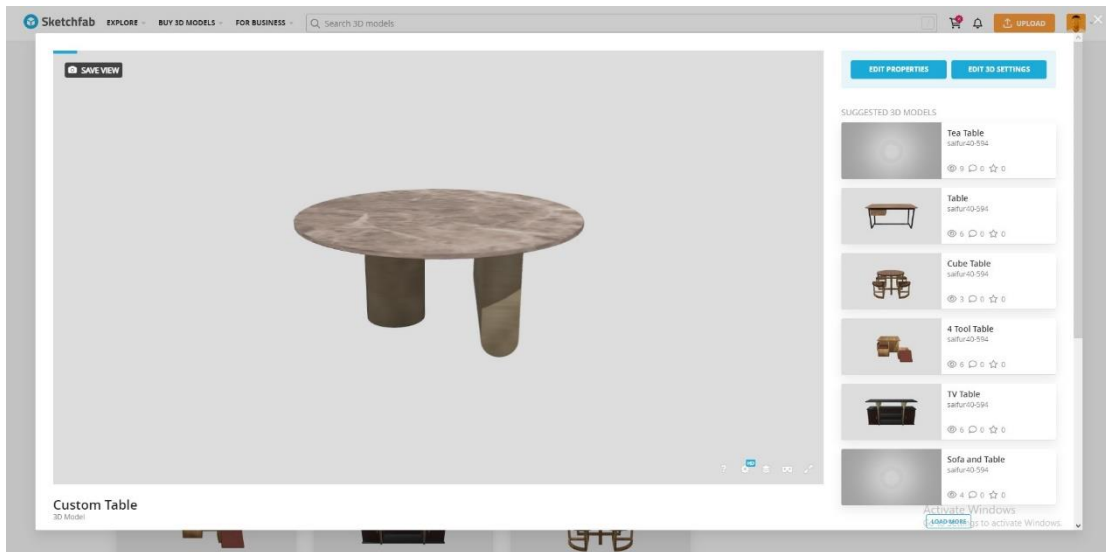


Figure 5.3.6.19: Center table View in Sketchfab

CHAPTER 6

CONCLUSION

Implementing 3D visualization in Bangladesh's furniture industry holds immense potential for growth, customer satisfaction, and reduced returns. By using 3D visualization, companies enhance product exploration, empower customers to make informed choices, and envision furniture in their space. Successful global cases demonstrate its effectiveness. Planning stages like idea generation, pre-production, and production are crucial. Investing in tools, expertise, and detailed 3D models elevates customer experiences and business growth. Recommendations include raising awareness, collaborating with 3D designers, and seamless integration. This technology offers a competitive edge in an evolving market.

CHAPTER 7

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" " THE IMPACT OF IMPLEMENTING 3D VISUALIZATION ON THE GROTH OF FURNITURE COMPANIES IN BANGLADESH " BY MOSTAFIZUR RAHMAN BHUIYAN ID: 191-40-592 [This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Multimedia and Creative Technology Supervised By: KAZI JAHID HASAN LECTURER Department of MCT Daffodil International University, DAFFODIL INTERNATIONAL UNIVERSITY DHAKA, BANGLADESH 19th -AUGEST-2023](#) [i ACKNOWLEDGEMENT](#) First, I express my heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final year project successfully. I grateful and wish our profound our indebtedness to Kazi Jahid Hasan, Lecturer, Department of Multimedia and Creative Technology, Daffodil International University, Dhaka. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stage have made it possible to complete this project. I would like to express my heartiest gratitude to Mr. Arif Ahmed, Associate Professor, Department of Multimedia and Creative Technology, Daffodil International University, Dhaka and Dr. MD Salauddin Ahmed, Department Head, Department of Multimedia and Creative Technology, Daffodil International University, Dhaka for their kind help to finish our project and to other faculty member and the staff of MCT department of Daffodil International University. I would like to thank my entire course mate in Daffodil International University, who took part in this discuss while completing the course work. Finally, I must acknowledge with due respect the constant support and patients of my parents. ii ABSTRACT In today's world the impact of online shopping has increased manifold. Even in Bangladesh its effect is being noticed. In the marketplace of Bangladesh, all types of products are mainly dealt with, furniture is one of them. If we talk about furniture, then there are many reputed furniture companies who also sell online. However, the websites display their furniture as two dimensional. under the influence of modern technology, many companies have started displaying their product as three-dimensional like Hatil already started showing their product their product Hatil have already started displaying their products in 3 dimension. Purchasing furniture online poses unique challenges, as customers often struggle to visualize how items will fit into their spaces and complement existing décor. In this context, 3D furniture design emerges as a powerful solution, revolutionizing the online shopping experience and significantly impacting e-commerce sales. 3D furniture design bridges the gap between the virtual and physical worlds, enabling customers to make informed purchasing decisions and enhancing their overall satisfaction. 3D models of furniture, allowing customers to explore products from various angles, zoom in on intricate details. Such immersive experiences foster a sense of confidence and trust in the product, mitigating concerns regarding size, color, and overall design compatibility. Through interactive 3D models, customers can manipulate furniture items, change colors, fabrics, and materials. This level of interactivity empowers consumers, enabling them to personalize their choices and envision the furniture within their own living spaces, thereby minimizing post-purchase dissatisfaction. 3D furniture design impacts on reducing returns and enhancing customer satisfaction. By offering an accurate representation of products, customers can make more informed decisions. Consequently, this leads to a reduction in costly returns, benefiting both consumers and retailers. Additionally, the increased customer satisfaction stemming from a better understanding of the product's features and aesthetics fosters positive reviews, referrals, and repeat

purchases, thereby boosting e-commerce sales. iii TABLE OF CONTENTS CONTENTS Acknowledgement Abstract Table of Contents [CHAPTER 1: INTRODUCTION](#) [1.1 Introduction](#) [1.2 Motivation](#) [1.3 Problem Identification](#) [1.4 Objective](#) [1.5 Expected Outcome](#) [CHAPTER 2: BACKGROUND STUDY](#) [2.1 Introduction](#) [2.2 Competitive Analysis](#) [CHAPTER 3: LITERATURE REVIEW](#) [3.1 Introduction](#) [3.2 Overview of the Furniture Industry in Bangladesh](#) [3.3 Importance of Visual Presentation in Furniture Marketing](#) [4.4 Benefits of 3D Visualization for Furniture Companies](#) [5.5 Challenges](#) [CHAPTER 4: CASE STUDY](#) [4.1 Introduction](#) [4.2 Case Study 1](#) [4.3 Case Study 2](#) [PAGE II III IV-V](#) [1-4](#) [1-2](#) [2](#) [3](#) [3-4](#) [5-7](#) [5](#) [6-7](#) [8-9](#) [8](#) [8-9](#) [9](#) [9](#) [10-11](#) [10](#) [10](#) [11](#) [iv](#) [4.4 Case Study 3](#) [CHAPTER 5: WORK PROCESS](#) [5.1 Thought process](#) [5.2 Pre-production](#) [5.2.1 Survey Question](#) [5.2.2 Idea Generation](#) [5.2.3 Collect Reference](#) [5.2.4 Analysis](#) [5.2.5 Sketch](#) [5.2.6 Project timeline](#) [5.3 Production](#) [5.3.1 Modeling](#) [5.3.2 UVW](#) [5.3.3 Texturing](#) [5.3.4 Lighting](#) [5.3.5 Rendering](#) [5.3.6 Final Output](#) [CHAPTER 6: CONCLUSION](#) [CHAPTER 7: REFERENCE](#) [11](#) [12](#) [12-13](#) [13-14](#) [14](#) [14](#) [14](#) [14-16](#) [16](#) [16](#) [16](#) [18](#) [18](#) [19](#) [19-20](#) [20-21](#) [21](#) [22](#) [23](#) v [CHAPTER 1 INTRODUCTION](#) [1.1 Introduction](#) The [present world has](#) advanced a lot in terms of [technology](#). Along with that, Bangladesh is also moving forward. Tag companies are leaning toward metaverse. Bangladesh is one of the most populous countries in South Asia. The people of this country are very aware in terms of technology and everyone started getting its benefits. Different countries of the world have started using three dimension of technology in expanding their business. The lack of three dimensions can be noticed in the expansion of online business in our country. There are some furniture companies in Bangladesh that are blessed with many reputations They display their products online as 2d image on their website. By doing this, the customer cannot verify the products in that way. 3D product visualization is an extremely useful set of tools and solutions for selling products online. It is also a new form of visual marketing for Bangladesh that gives businesses the ability to provide an interactive, photorealistic representation of products. Today, most customer interactions occur online. Due to the current technological progress in Bangladesh, very few people now-a-days go to the market and buy the products. Most of those who do getting a general idea from online. People are no longer restricted to viewing a single image of a product — they can now explore the product in three dimensions in an interactive environment. This type of virtual tour encourages users to physically interact with the products displayed in this environment mobile, tablet and computer. The purpose of this study is to delve into the advantages and implications of incorporating 3D visualization technology into the sales process within the context of the furniture industry in Bangladesh. By examining the potential impact, we seek to understand how this technology can enhance the customer experience and contribute to the growth and competitiveness of furniture businesses in the country. the integration of 3D visualization technology holds significant potential for the furniture industry in Bangladesh. By providing customers with an enhanced and interactive buying experience, businesses can differentiate themselves in a competitive market, drive sales, reduce returns, and build customer loyalty. Through this thesis, we will delve deeper into this topic, examining its advantages, challenges, and potential implications for the growth of the furniture industry in Bangladesh. **1.2 Motivation** Current Challenges: The furniture industry in Bangladesh faces several challenges, including limited customer engagement and operational inefficiencies. Competitive Landscape: With a growing number of furniture companies globally adopting 3D visualization, there is an increasing need for companies in Bangladesh to keep pace and remain competitive. Customer Expectations: Modern consumers have higher expectations for interactive and immersive shopping experiences, including the ability to visualize furniture in a realistic 3D format. Potential Benefits: Implementing 3D visualization can lead to improved sales, enhanced customer satisfaction, reduced returns, and a competitive edge in the market. Industry Growth Potential: By embracing this technology, furniture companies in Bangladesh can tap into the rising demand for visually immersive online shopping experiences and drive industry growth. Positive Impact: The implementation of 3D visualization not only benefits individual furniture companies but also contributes to the overall growth and development of the furniture industry in Bangladesh. **1.3 Problem Identification** While furniture companies around the world are increasingly using 3D visualization to display their products, the majority of furniture companies in Bangladesh have not adopted this technology. This lack of 3D visualization poses several challenges, including reduced sales, limited customer growth, and increased product returns. Without the ability to provide customers with an immersive and interactive shopping experience, furniture companies in Bangladesh may struggle to meet customer expectations and compete effectively in the market. **1.4 Objective** To examine how the integration of 3D visualization technology can enhance sales in the furniture industry. To explore the ways in which 3D visualization can improve customer experience and satisfaction. To assess the impact of 3D visualization on operational efficiency and the reduction of returns. To understand how the adoption of 3D visualization can provide a competitive advantage and improve the market positioning of furniture companies in Bangladesh. **1.5 Expected Outcome** The expected outcomes of implementing 3D visualization in the furniture industry in Bangladesh can have a significant impact on the growth and competitiveness of companies. I. Increased Sales: The implementation of 3D visualization technology can lead to increased sales for furniture companies. By providing customers with a realistic and immersive view of furniture products, it enhances their understanding and confidence in their purchasing decisions. II. Improved Customer Satisfaction: 3D visualization allows customers to explore furniture products in detail, enabling them to make more informed choices. By offering a visual representation of size, design, color, and material options, customers can customize and personalize their furniture selections according to their preferences. III. Reduced Product Returns: One of the significant benefits of 3D visualization is its potential to reduce product returns. By providing customers with an accurate representation of furniture products, including size, color, and design, it minimizes the risk of mismatched expectations. IV. Competitive Advantage: Implementing 3D visualization in the furniture industry can give companies a competitive edge. It allows them to differentiate themselves by providing a unique and interactive shopping experience. V. Enhanced Marketing and Branding: 3D visualization provides opportunities for creating engaging marketing materials, such as high-quality visuals, videos, and interactive product displays. This can strengthen brand perception and increase brand awareness in the market. **CHAPTER 2 BACKGROUND STUDY** **2.1 Introduction** Bangladesh's furniture sector is a major employer and driver of GDP growth, making a considerable contribution to the national economy. But marketing furniture to clients effectively presents a significant barrier for the sector. The majority of furniture businesses in Bangladesh have not yet adopted this technology, despite the global

trend of furniture companies employing 3D visualization to promote their products. There are a number of issues caused by the lack of 3D visualization, including lower sales, slower customer growth, and more product returns. Without the ability to provide customers with an immersive and interactive shopping experience, furniture companies in Bangladesh may struggle to meet customer expectations and compete effectively in the market. Bangladesh has seen a remarkable increase in internet penetration over the past few years. The government's initiatives to expand internet infrastructure and the availability of affordable smartphones have played a crucial role in connecting more people to the internet. As more individuals gain access to the online world, the potential customer base for online businesses expands, driving growth in the sector. The rise of e-commerce platforms in Bangladesh has made it easier for businesses to establish an online presence and reach customers across the country. The online furniture business in Bangladesh has also witnessed significant growth in recent years. Online furniture businesses offer convenience and accessibility to customers. Instead of physically visiting multiple stores, customers can browse through a wide range of furniture options from the comfort of their homes. They can easily compare prices, designs, and features before making a purchase. Many online furniture stores now utilize virtual visualization tools that [allow customers to visualize how the furniture would look in](#) their space.

2.2 Competitive Analysis

While more and more furniture businesses worldwide are adopting 3D visualization to showcase their products, most furniture businesses in Bangladesh still have not embraced this technology. . HATIL Furniture is a renowned furniture company in Bangladesh that offers furniture with a 3D view. Here are some additional details about HATIL Furniture and its 3D visualization feature: Company Background: HATIL Furniture [is one of the leading furniture manufacturers and retailers in](#) Bangladesh. It has established a strong presence in the market with a reputation for quality craftsmanship and innovative designs. The company offers a wide range of furniture products, including residential, office, and institutional furniture.

3D Visualization Feature: HATIL Furniture stands out in the industry by offering a 3D visualization feature for its furniture products. This feature allows customers to view and interact with furniture items in a virtual 3D environment. By leveraging advanced technology, customers can rotate, zoom in, and examine furniture pieces from various angles, providing a realistic and immersive experience. Benefits of 3D Visualization: The 3D visualization feature offered by HATIL Furniture brings several benefits to customers. It enables them to visualize furniture items in their intended space, helping them make informed decisions about size, design, and placement. This feature also allows customers to assess how the furniture will harmonize with their existing décor and overall interior design, improving the purchasing experience. Customization Options: In addition to providing a 3D view of their standard furniture designs, HATIL Furniture offers customization options. Customers can personalize their furniture selections by choosing from a range of materials, colors, finishes, and configurations. The 3D visualization feature allows customers to see how their customization choices will look before making a purchase, ensuring that the final product meets their preferences. Online Presence and User Experience: HATIL Furniture has an online platform where customers can explore their furniture collection and access the 3D visualization feature. The website provides a user-friendly interface that allows customers to browse different furniture categories, view product details, and visualize items in 3D. This enhances the convenience and accessibility of the furniture shopping experience. Competitive Advantage: HATIL Furniture's offering of 3D visualization gives them a competitive advantage in the market. It sets them apart from other furniture companies in Bangladesh that may not provide a similar feature. The 3D visualization feature enhances customer engagement, reduces uncertainty, and increases customer satisfaction, ultimately contributing to the company's growth and market position.CHAPTER 3 LITERATURE REVIEW3.1 Introduction This chapter presents a comprehensive [review of relevant literature on the implementation and impact of 3D visualization in the furniture industry.](#) It explores studies, research articles, and industry reports to gather insights into the benefits, challenges, and best practices associated with incorporating three-dimensional visualization technology. The literature review aims to establish a theoretical foundation for understanding the potential impact of 3D visualization on the growth and performance of furniture companies.3.2 Overview [of the Furniture Industry in Bangladesh](#) [The furniture industry in Bangladesh](#) holds considerable importance [in the country's economy.](#) [The furniture industry in Bangladesh](#) has a long history rooted in traditional craftsmanship. Local artisans have been producing furniture using traditional techniques and materials for many years. However, with the advent of modern technology and evolving consumer preferences, the industry has undergone significant transformations. Presently, the furniture industry in Bangladesh is experiencing growth and diversification. The furniture market in Bangladesh has witnessed steady growth over the years. Factors such as rapid urbanization, increasing disposable incomes, and changing consumer lifestyles have contributed to the expansion of the market. Several manufacturing clusters have emerged in Bangladesh, with regions like Dhaka, Chittagong, Gazipur, and Narayanganj being major furniture production hubs. The furniture industry in Bangladesh has shown considerable potential for exports. The country exports furniture products to various international markets, including the United States, Europe, Australia, and the Middle East. Recognizing the importance of the furniture industry, the government of Bangladesh has taken initiatives to support its growth.3.3 Importance of Visual Presentation in Furniture Marketing This section examines the significance of visual presentation in the marketing of furniture products. It discusses the role of aesthetics, design, and visual appeal in influencing consumer preferences and purchase decisions. Furthermore, it explores the limitations of traditional two-dimensional visual representations and highlights the need for more immersive and realistic experiences provided by 3D visualization.3.4 Benefits of 3D Visualization for Furniture Companies In this section, the literature review examines the potential benefits that furniture companies can derive from implementing 3D visualization technology. It explores studies and case examples that demonstrate how 3D visualization enhances the customer experience, improves sales performance, reduces product returns, and streamlines the design and manufacturing processes. The section also highlights the positive impact of 3D visualization on customer engagement, brand perception, and competitive advantage.3.5 Challenges While 3D visualization offers numerous advantages, this section explores the challenges and considerations that furniture companies may encounter during its implementation. It discusses issues related to technological infrastructure, skill requirements, cost implications, and data management. The review also explores the potential limitations and drawbacks of 3D visualization, including user experience concerns and the need for ongoing software updatesChapter 4 CASE STUDY4.1 Introduction: This chapter

presents case studies of furniture companies from around the world that have successfully implemented 3D visualization technology. These case studies provide practical examples of how incorporating three-dimensional views of furniture products has benefited companies in terms of sales growth, customer satisfaction, and operational efficiency. By examining these real-world examples, valuable insights can be gained for furniture companies in Bangladesh considering the adoption of 3D visualization. 4.2 Case Study 1: IKEA IKEA is a leading furniture manufacturer based in a European country. The company integrated 3D visualization technology into its online platform, allowing customers to interact with furniture products in a virtual environment. The implementation resulted in a significant increase in online sales, as customers were able to visualize the furniture's design, color options, and various configurations. The 3D visualization also reduced the number of product returns, as customers had a clearer understanding of the furniture's dimensions and appearance before making a purchase. Overall, the implementation of 3D visualization enhanced the customer experience, improved sales performance, and established IKEA as an innovative and customer-centric brand. IKEA is among the earliest businesses that started using 3D and AR technology in their marketing strategy. Back in 2017, IKEA introduced its AR app, called IKEA Place. With it, users can virtually place true-to-scale 3D models in their homes before purchasing. company's online sales increased by 43%; 2019, the company reached \$40 billion annual revenue worldwide. A part of that is associated with increased online sales. Being an early and successful adopter of AR technologies, IKEA is an excellent example to other eCommerce brands to start implementing the latest technologies in their 4.3 Case Study 2: Wayfair Wayfair is a furniture retailer operating in a large North American market. Seeking to differentiate itself from competitors, the company introduced augmented reality (AR) technology to its mobile app. Customers could now virtually place furniture pieces in their own living spaces using their smartphones or tablets. This interactive and immersive experience significantly increased customer engagement, leading to higher conversion rates and customer satisfaction. Wayfair also observed a decrease in product returns, as customers were more confident about their purchase decisions after experiencing the furniture in their own environments. The successful implementation of AR-based 3D visualization helped Wayfair establish a strong online presence and drive sales growth. 33% increase in their conversion rate for strollers; and a 21% increase in visitors' average time spent on the brand's online shop. marketing strategy. The company's CEO Juergen Schuster admits that even though their products are stylish and appealing, they're also large. Therefore, marketing them through 2D images was not enough. To solve this issue, Garten und Freizeit started implementing 3D visualization technology, and soon their sales conversions increased up to 60%. 4.4 Company 3: Hatil HATIL Furniture is one of the leading furniture manufacturers and retailers in Bangladesh. HATIL Furniture stands out in the industry by offering a 3D visualization feature for its furniture products. This feature allows customers to view and interact with furniture items in a virtual 3D environment. By leveraging advanced technology, customers can rotate, zoom in, and examine furniture pieces from various angles, providing a realistic and immersive experience. The 3D visualization feature offered by HATIL Furniture brings several benefits to customers. It enables them to visualize furniture items in their intended space, helping them make informed decisions about size, design, and placement. CHAPTER 5 WORK PROCESS 5.1 Thought process Defining Objectives: Clearly define the objectives and desired outcomes of implementing 3D visualization. This may include goals such as increasing customer engagement, reducing product returns, improving online sales conversions, or differentiating the brand from competitors. Target Audience Analysis: Identify the target audience and their preferences, needs, and expectations. Understand their purchasing behavior, online browsing habits, and the factors that influence their buying decisions related to furniture products. Market Trends and Competitor Analysis: Stay informed about the latest market trends in the furniture industry, particularly regarding the use of 3D visualization. Analyze how competitors are leveraging this technology and identify opportunities for differentiation and innovation. Customer Pain Points: Identify the pain points that customers face when shopping for furniture, such as uncertainty about product fit, color accuracy, or design variations. Explore how 3D visualization can address these pain points and provide solutions that enhance the customer experience. Value Proposition: Determine the unique value proposition that 3D visualization can offer to customers. Consider the ways in which it can improve their decision-making process, provide a realistic representation of products, and enable customization options. Feasibility Assessment: Assess the feasibility of implementing 3D visualization within the existing infrastructure, considering factors such as available resources, budget, technological requirements, and potential challenges. Evaluate whether the benefits outweigh the costs and potential risks. Innovation and Creativity: Encourage creative thinking and innovation in utilizing 3D visualization. Explore new ideas, concepts, and approaches that can differentiate the company and create a unique selling proposition in the market. 5.2 Pre-Production We identify the desired level of detail, such as material textures, finishes, and functionality that should be accurately represented in the visualizations. We collect comprehensive information about the furniture products to be visualized. This includes dimensions, materials, colors, available configurations, and any other relevant details. We develop a content schedule or timeline that outlines the key milestones and deadlines for the pre-production phase. Then we allocate sufficient time for collecting product information and creating 3D models. Develop 3D Models: We generate 3D models based on the collected product information. This can be done by us. We ensure that the 3D models accurately represent the dimensions, shapes, and details of the furniture products. Texturing and Materials: Apply appropriate textures and materials to the 3D models to accurately represent the look and feel of the furniture. Consider factors such as wood grains, fabric patterns, metal finishes, and other visual elements that contribute to the realism of the visualizations. Quality Assurance: Conduct thorough quality checks to ensure the accuracy and integrity of the 3D visualizations. Verify that the dimensions, proportions, and details of the furniture products are accurately represented. Test the visualizations on various platforms and devices to ensure compatibility and optimize performance. Finalize Pre-production Assets: Prepare the finalized 3D models, textures, lighting setups, and other assets for the production phase. Ensure that all necessary files and documentation are organized and easily accessible for the production 5.2.2 Idea Generation Considering the furniture that is most used in home and office in Bangladesh, we have selected those types of furniture for our project. Our objective is to present people who are connected to the online world and who are comfortable shopping online in their busy lives with a real photo realistic view of their purchased products. So that they can see their product in

360 degree view or three dimensional view. Get the right idea about the product, online customer engagement will increase, our selected furniture is Almira, Sofa, Chair, Table, Bed, Side table, Center table, Tv cabinet etc. 5.2.2 Collect Reference As per my idea I try to collect the reference from internet. I search photos and videos in Google, YouTube, Pinterest, and Furniture websites. I collect the reference photos. And make a clear idea about my furniture design. 5.2.3 Analysis Material: From our user research part, we came to know that most people like the wooden furniture. [A well-made piece of wood furniture has strength and durability, especially](#) when [it is built of domestic hardwoods \(use- Oak, Mehegoni, Akashmini\)](#). [Furniture made of solid wood is classic, durable, and designed to survive for many decades or even centuries](#). Size: After analysis Bangladeshi furniture size, we try to design all my furniture like our traditional comfort furniture. we mention the furniture dimension in feet. 1. Modern Bookcase: Width: (shelf – 4') ,Length: 10", Height: 4' 2. Almira: Width: 5', Length: 1.5', Height: 7' 3. Tea Table: Width: (1.5') (, Length: (3.5') , Height: (1.5') 4. Bed: Width: (5') , Length: 7', Height: (1.3') 5. Sofa: Width: (2') , Length: (6') , Height: (1.2)

Cost: The cost list will vary depending on the material, design, and measurements. I made the list by discussing with the carpenter. 1. TV wall cabinet: Thirty Thousand Taka 2. Storage bed: Forty Thousand Taka 3. Bookcase: Eight Thousand Taka 4. Sofa: Twenty six Thousand Taka 5. Tea table: Seven Thousand Taka Design: I try to make the design mixes of our traditional furniture and modern minimalistic furniture. Therefore, the furniture will be familiar to the users and will have a modern vibe. It will be convenient to use them. Software: I required some specific software and materials for my project. These are the programs, plugins, and scripts I use. [Autodesk 3ds Max 2020](#) [A professional 3D computer graphic tool](#) called Autodesk 3ds Max is used to create 3D models, animations, games, and image visualizations. Other names for it include 3D Studio and 3D Studio Max Along with versatile plugin architecture, it provides modeling capabilities. [It is frequently used by companies that create video games](#), several [TV commercial studios](#), [and architectural](#) visualization companies. [18] V-Ray Chaos, a Bulgarian software business, created the biased rendering software program known as V-Ray. [V-Ray is a for-profit plug-in for third-party 3D computer graphics software](#) programs [that is employed for computer graphics and visualizations in a variety of fields](#), including [media, entertainment, film and video game development, industrial design, product design, and architecture](#). Autodesk MAYA [A 3D computer graphic program called Maya is employed in the creation of animated movies, TV shows, video games, and other visual effects. This software's ability to produce large models enables us to provide Ultra 3D effects that render a realistic view for the user.](#) Autodesk [Maya is the](#) abbreviated form [of](#) the full name. Originally developed by "Alias Systems Corporation," [Autodesk now owns full rights to the software. Additionally, it functions on Linux, Mac OS, and Windows.](#) [21] Rizom UV [2022](#) A software program called Rizom UV is used to produce and edit UV maps for 3D objects. A crucial step in the texturing process [for 3D graphics, UV maps are used to map a 3D model's surface to a 2D texture.](#) [22] Figure 5.2.3:4: Rizom UV interface Substance [Painter For 3D experts and aficionados, Adobe Substance 3D Painter is the go-to texturing software.](#) Because of [Painter's](#) unmatched speed, flexibility, and visual quality, the industry relies on it to bring its creations to life. 5.2.4 Sketch I sketched all the furniture base and add the measurement. I've included my hand-drawn illustration below. 1. G Shape : 2. Storage bed: 3. Cube shape table: 4. Storage dressing table: 5. Tea table: 5.2.5 Project Timeline We made a Gantt chart for our project timeline. 5.3 Production We began working on my project's production after the pre-production phase. Below, We've provided a description of one furniture's entire production process. 5.3.1 Modeling We gather reference images and sketches of all the product. This helps us understand the dimensions, proportions and details of the model. 1.Start a New Project: Launch Autodesk 3ds Max and start a new project to work in 2.Set Up Units: Configure the units of measurement according to your preference or the specifications provided in the reference images. 3.Create a Base Shape: Begin by creating a base shape that represents the overall form of the furniture. Use the reference images to guide you in creating the correct size and shape. 4.Modify the Shape: Use various modeling tools and techniques in 3ds Max to modify the base shape and add details to match the reference images. This can include using tools like Extrude, Bevel, Chamfer, and Cut to create edges, corners, and intricate details. 5.Add other Features: Depending on the design of the furniture, we create and attach, supports, or other features. Use additional primitive objects or modify the existing shape to create these elements. 5.3.2 UVW We used the Rizom UV software to create the UV. I completed the texturing with Substance Painter after finishing the UV. I add a wooden texture and set the parameter of every texture map to approximate a real wooden texture. 5.3.3 Texturing To texture a model in Substance Painter, We follow these step-by-step instructions: Import the Model: Launch Substance Painter and create a new project. Import your model into the project by the File > Import menu. Set Up the Texture Set: create a new texture set by clicking on the "+" icon in the Texture Set List panel. Choose a Material: Select material from the Shelf or Material Library panel that matches for our model. Apply the Material: Drag and drop the chosen material onto the desired texture set or individual mesh parts in the 3D View. Customize the Material: Adjust the material parameters and settings to fine-tune the look and feel. Export Textures: Once we've satisfied with texturing work, then it's time to export our textures, use the File > Export Textures menu to export the final textures. Test and Preview: Substance Painter allows us to preview our textured model in real-time. Use the 3D View to inspect our model from different angles, assess the textures' appearance, and make any necessary adjustments before finalizing the project. 5.3.4 Lighting To lighting furniture model in 3ds max, We follow these step-by-step instructions: Set Up the Scene: Start by creating an interior scene in 3ds Max. Place the furniture model within the scene at the desired location. Create Lights: To light the furniture, In 3ds Max, there are several types of lights we use, such as Omni light, Spot light, Direct light. Position the Lights: We may want to use a spotlight to highlight specific details or a soft, diffused light for a more even illumination. Modify the properties of each light to fine-tune their appearance and behavior. Ensure that the furniture materials are properly configured to respond to the lighting in the scene. Render the Final Image: Once we satisfied with the lighting setup, configure the rendering settings in 3ds Max according to your requirements. Adjust parameters like resolution, file format, and quality settings. Then initiate the rendering process to generate the final image or animation. 5.3.5 Rendering To render a scene in 3ds Max using V-Ray, you can follow these step-by-step instructions: Set up the Render Output Settings: We go to the Render Setup dialog by clicking on the Rendering menu and selecting Render Setup. In the Common tab, choose the desired image output format (e.g., JPEG, PNG) and set the image size/resolution. Select the

output location where the rendered images will be saved. Configure V-Ray as the Renderer: In the Assign Renderer section, choose V-Ray as the Production renderer. Click on the "... " button next to V-Ray Renderer to open the V-Ray settings dialog. Adjust V-Ray Render Settings: In the V-Ray settings dialog, numerous options to control the rendering process. Start the Render: Click the Render button in the Render Setup dialog to start the rendering process. Save the Rendered Images: Once the rendering is complete, we save the rendered images to the specified output location. 5.3.6 Final output Simple table: Now our textured model ready to upload sketchfab. So we sign up Sketchfab account. Prepare Model: We export our model 3ds max file to obj formats. Our model is textured by adobe substance painter. And UV mapping by RizomUV. Start the Upload Process: Once signed in, click on the "Upload" button on the Sketchfab website's top navigation menu. We Drag and drop our model file into the designated area on the upload page or use the file browser to select the file from our computer. Configure Settings: We Fill in the required information for your model, including title, description, and tags. Provide a clear and concise description to help users understand our model. Publish Model: Then publish our model to sketchfab. Once the upload is complete, we'll be redirected to the model's page on Sketchfab. From there, we can view your model in 3D, explore it from different angles, and interact with it. CHAPTER 6 CONCLUSION Implementing 3D visualization in Bangladesh's furniture industry holds immense potential for growth, customer satisfaction, and reduced returns. By using 3D visualization, companies enhance product exploration, empower customers to make informed choices, and envision furniture in their space. Successful global cases demonstrate its effectiveness. Planning stages like idea generation, pre-production, and production are crucial. Investing in tools, expertise, and detailed 3D models elevates customer experiences and business growth. Recommendations include raising awareness, collaborating with 3D designers, and seamless integration. This technology offers a competitive edge in an evolving market. CHAPTER 7 REFERENCE <https://hatil.com> <https://www.furniturebari.com> <https://sketchfab.com/saifur40-594> <https://gltf-viewer.donmccurdy.com> <https://www.cadcrowd.com/blog/why-is-3d-modeling-important-for-product-manufacturing-companies/> <https://vinnomedia.com/benefits-of-3d-product-visualization-furniture/> <https://www.thedailystar.net/business/economy/news/hatil-idea-established-brand-2166596> <https://www.threekit.com/blog/top-6-brands-using-visual-configuration-furniture> <https://straitresearch.com/blog/top-10-best-furniture-companies-in-the-world> <https://www.sayduck.com/post/how-furniture-companies-drive-sales-with-3d-and-augmented-reality> <https://www.le-studio3d.com/visualization-3d-of-furniture/?lang=en> <https://blog.cylindo.com/7-benefits-3d-product-visualization-furniture-brands> <https://zolak.tech/blog/3d-commerce> <https://gltf-viewer.donmccurdy.com> 24 ©Daffodil International University ©Daffodil International University ©Daffodil International University ©Daffodil International University ©Daffodil International University 1 ©Daffodil International University 2 ©Daffodil International University 3 ©Daffodil International University 4 ©Daffodil International University 5 ©Daffodil International University 6 ©Daffodil International University 7 ©Daffodil International University 8 ©Daffodil International University 9 ©Daffodil International University 10 ©Daffodil International University 11 ©Daffodil International University 12 ©Daffodil International University 13 ©Daffodil International University 14 ©Daffodil International University 15 ©Daffodil International University 16 ©Daffodil International University 17 ©Daffodil International University 18 ©Daffodil International University 19 ©Daffodil International University 20 ©Daffodil International University 21 ©Daffodil International University 22 ©Daffodil International University 23