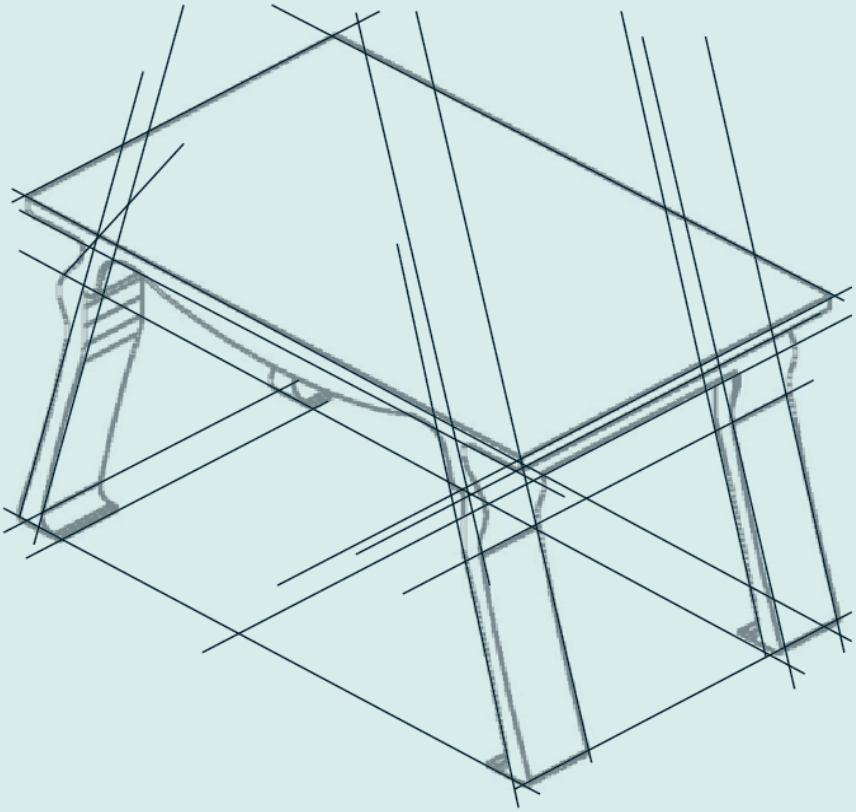

Augmented Reality and Generative Design:
Practices for Product Designs

Lecturer Hayrettin MERİÇ

İKSAD
Publishing House

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Uşak University, Banaz Vocational College

İKSAD Publishing House

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PREFACE

Mankind has always dreamed. He followed these dreams, made an effort to reach his dreams, and in the end, he either achieved these dreams or at least got closer. Technological developments have always been in this direction. Technologies have been dreamed up, some of which have been the subject of science fiction or action movies; These dreams have been realized to a great extent with the scientific studies carried out. Three technologies that have become increasingly popular in recent years; Augmented reality (AR), virtual reality (VR) and mixed reality (MR) are examples of these dreams that were first made into movies and then realized. These concepts, which are often used interchangeably, are different from each other, although they have similar aspects. The common feature of these three technologies is that they work together with a wearable device such as glasses and a helmet or a mobile device such as a tablet computer and smartphone. Augmented reality is the technology that enables the visualization of virtual objects in the real environment. That is, while we continue to see the environment we are physically in, it also allows us to see objects that are not physically in that environment (such as sounds, videos, two- or three-dimensional objects, animations).

Augmented reality applications, thanks to their different features, have positive effects on the quality of life and lifestyles in some areas where it was impossible for people to benefit before. AR applications, especially used in areas that directly affect human life such as medicine and education, not only save people's lives and increase their quality of life; It also enables the doctors who undertake this mission to be trained more competently. Applications used in trade-oriented areas such as entertainment, travel, architecture/construction, design and advertising affect people's quality of life and lifestyle. This new sector has a positive impact on the acceleration of social development by contributing to capital and employment.

Considering the worldwide success of Pokémon Go, we can say that augmented reality has been adopted by a wider audience. Today, all it takes to experience augmented reality is a camera smartphone and an augmented reality app. We can use the whole world as a canvas at no other cost. The latest developments in the gaming world promise to further increase the augmented reality trends.

AR may be experiencing the calm before the storm these days. With parameters such as 5G technology, the spread of LIDAR technology in devices and the development of deep learning models in artificial intelligence, AR can come into our life very strongly.

The development of these three technologies (AR, VR and MR) continues. Thanks to these developments, these technologies will become a part of our daily lives. We follow all these developments and what they will offer to humanity with great excitement.

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To my dear wife Arzu…

1.INTRODUCTION

The evolution of technology, from the discovery of simple tools and equipment to its use for scientific research, accelerated with the industrial revolution that emerged two centuries ago. The incredibly rapid development of technology throughout the history of humanity has led to the change of many economic, political, social and cultural paradigms. In the historically, four main industrial revolutions have emerged. It would be correct to say that each era has emerged as a result of its specific technological, social and economic needs and has been implemented to meet these needs. (1).

Technological innovations in the 21st century is changing every aspect of life. These technologies contribute to many innovations that will facilitate human life in sectors such as industry, engineering, defense industry, communication and education. New technologies such as artificial intelligence, robotics, augmented reality, cloud systems are reshaping many sectors from industry to entertainment. Augmented reality has an important place among these technologies. Augmented reality (AR) is a technology in which real and virtual objects interact at the same time, and virtual objects are combined with the real world. AR enables interaction with these objects as a result of transferring 3D objects prepared in the computer environment to the real world. It provides opportunities such as holding, touching, changing and transforming virtual objects transferred to the real world (2).

The purpose of this book is to apply augmented reality practices to product designs created by generative design. In addition, rather than containing literature review, the book is an interactive research work with many applications.

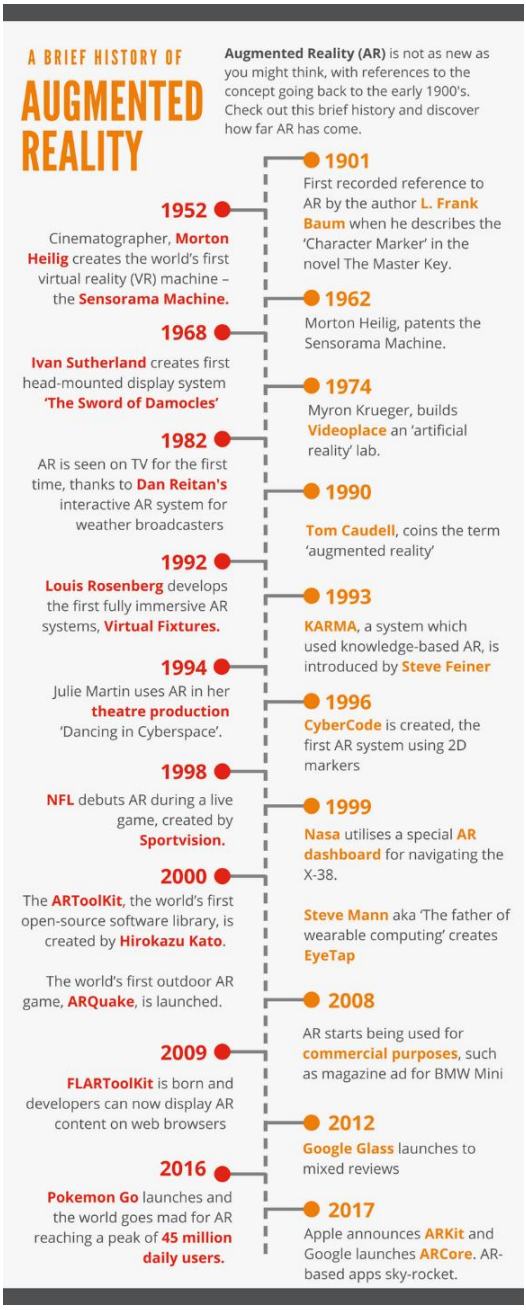
1.1. Augmented Reality

Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic,

somatosensory and olfactory. AR can be defined as a system that incorporates three basic features: a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects. The overlaid sensory information can be constructive (i.e. additive to the natural environment), or destructive (i.e. masking of the natural environment). This experience is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real-world environment, whereas virtual reality completely replaces the user's real-world environment with a simulated one (3).

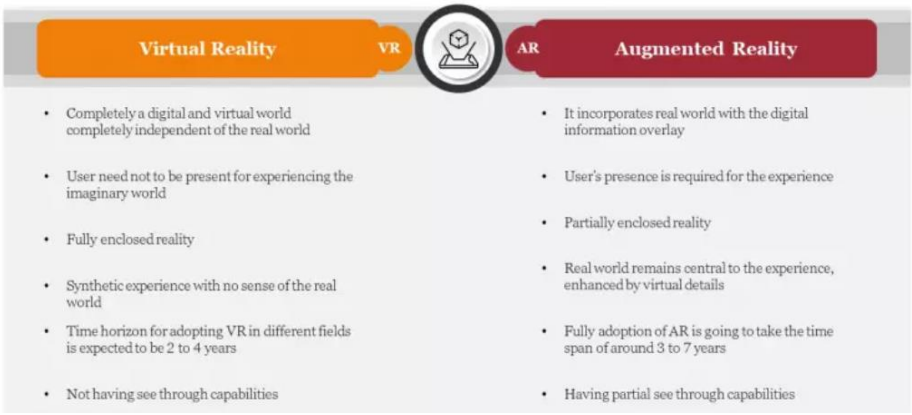
The evolution of AR is shown in figure 1.

Figure 1: History of AR (4)



When AR and VR are compared, it is seen that VR can cause a sense of insecurity and health problems in users. In addition, many technological tools are needed when using VR applications. These tools can be costly. AR, on the other hand, does not create a concern in human health or a situation that will create a sense of insecurity, as users continue their activities in the real-world environment. AR applications can be easily used with low costs using a smartphone or tablet (2). Comparison of AR and VR features is shown in figure 2.

Figure 2: Difference Between AR and VR (5)



Augmented reality technology is a constantly growing and evolving discipline. It produces solutions in various fields such as entertainment, industry, art-museum, education, advertising-marketing, architecture, design and medicine. In addition, the number of books with AR applications is increasing day by day.

1.2. Generative Design

Generative design is the process of using algorithms to help explore variants of a design beyond what is currently possible using the traditional design process. Generative design, simulating the natural evolutionary approach, uses parameters and goals to find the best solution and quickly explore thousands of design variants (6).

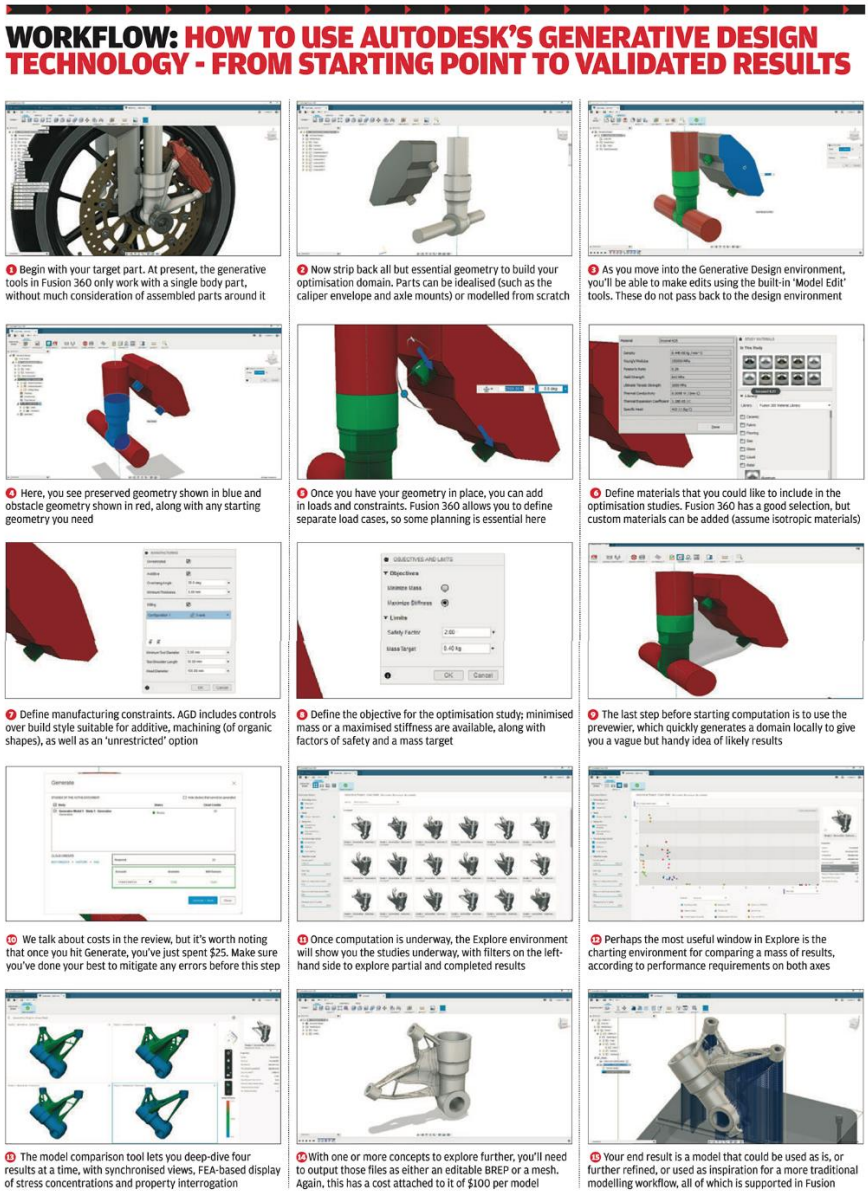
Generative design uses machine learning to simulate nature's evolutionary approach to design. Designers or engineers enter design parameters (such as material, size, weight-mass, strength, manufacturing methods, and cost constraints) into generative design software, and the software explores all possible solution combinations, quickly generating hundreds or even thousands of design options. Then, designers or engineers can filter and choose the results to best meet their needs (6).

Autodesk explains generative design as follows: "*Generative design is a design exploration process. Designers or engineers input design goals into the generative design software, along with parameters such as performance or spatial requirements, materials, manufacturing methods, and cost constraints. The software explores all the possible permutations of a solution, quickly generating design alternatives. It tests and learns from each iteration what works and what doesn't*." (7).

Fusion 360 is a 3D design and collaboration tool that allows users to build and evaluate 3D CAD models and drawings. This is the tool we will use to build, document, and evaluate the models that we will use for generative design. Generative design is a tool that is available in Fusion 360. The setup and configuration for generative design is completed inside the local software. The files and setup are uploaded, and the analysis is completed in a server where you can review the results and then download the finished result. Figure 3 shows an example workflow for using generative design in Fusion 360 software (8).

Product designs created by generative design were used in the AR apps book. The product designs used in this research were created in published book research (6,9).

Figure 3: Workflow for Fusion 360 Generative Design (8)



2. METHOD

- Unity software (version Unity 2018.3.5f1) was chosen for AR applications that form the basis of this book research.

- In 2 different book research published in 2021 (6,9); Using the generative design tool in the fusion 360 software, a wide variety of designs based on manufacturing methods were created for 7 different products. In the book research involving AR applications, product designs created in the two books works were used as 3D objects.

- This book contains 90 different 3D objects. As the image target, a photograph of the perspective view of each product design was used. Photos were matched with 3D product designs via vuforia software.

- In order to ensure the rotation of the product designs, the necessary coding was done in Microsoft Visual Studio software 2017 (C# programming language was used as software).

- Finally, an apk application was created with the name AR_BOOK2 (for Android platform). The developed application is suitable for mobile devices with Android 7 and higher versions. The apk application for Android can be downloaded via the QR code below.

3. IMPLEMENTATIONS FOR PRODUCT DESIGNS

3.1. BOOKSHELF

Table 1: Bookshelf-1

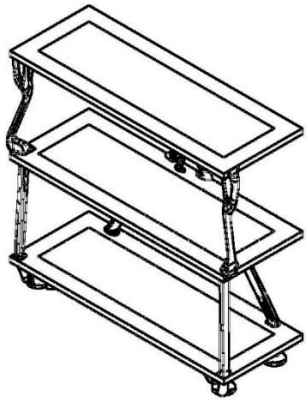
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation - Manufacturing method **Unrestricted** Visual similarity **Ungrouped** Production volume (pcs.) - Volume (mm^3) **1.41e+7** Mass (kg) **11.28** Max von Mises stress (MPa) **1.638** Factor of safety limit **2** Min factor of safety **4.713** Max displacement global (mm) **1.154**	

Table 2: Bookshelf-2

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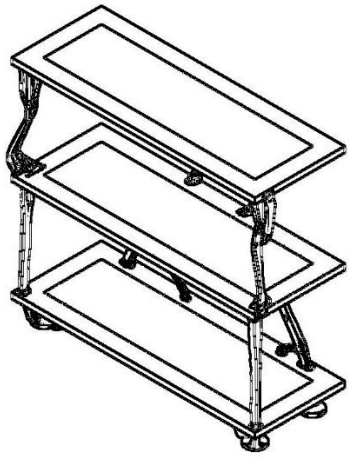
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Z+, Z-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Group 1</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>1.388e+7</td></tr>
<tr><td>Mass (kg)</td><td>11.101</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.489</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>5.186</td></tr>
<tr><td>Max displacement global (mm)</td><td>1.204</td></tr>
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Table 3: Bookshelf-3

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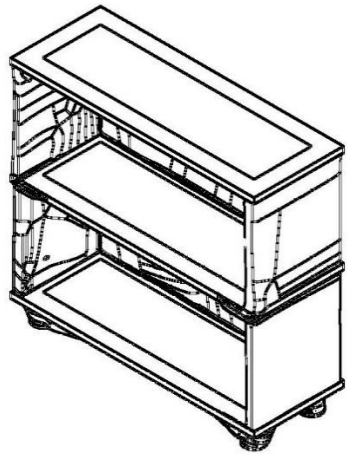
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Y-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Group 2</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>3.378e+7</td></tr>
<tr><td>Mass (kg)</td><td>27.022</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.61</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>12.662</td></tr>
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Table 4: Bookshelf-4

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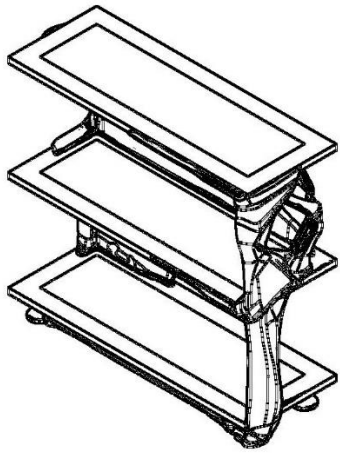	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, X-** Manufacturing method **Die casting** Visual similarity **Group 3** Production volume (pcs.) **-** Volume (mm^3) **2.66e+7** Mass (kg) **21.283** Max von Mises stress (MPa) **3.585** Factor of safety limit **2** Min factor of safety **2.153** Max displacement global (mm) **1.306**	

Table 5: Bookshelf-5

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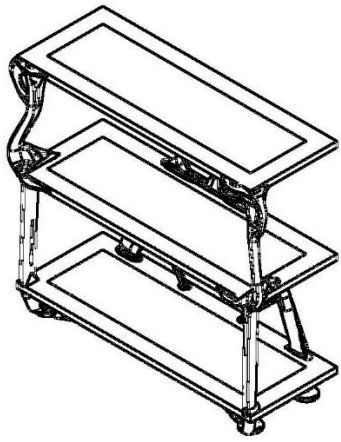
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Unrestricted</td></tr>
<tr><td>Manufacturing method</td><td>5 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Ungrouped</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>1.492e+7</td></tr>
<tr><td>Mass (kg)</td><td>11.937</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.047</td></tr>
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<tr><td>Min factor of safety</td><td>7.377</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.902</td></tr>
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Table 6: Bookshelf-6

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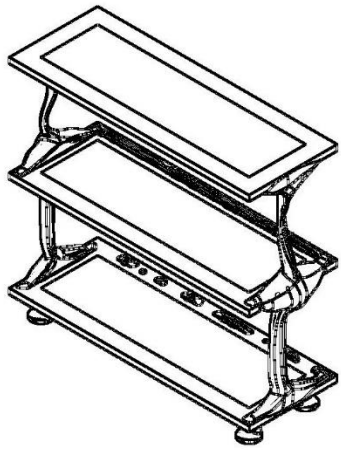
<tr><td colspan="2">  </td></tr>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Z+, Y-, Z-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Ungrouped</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>1.475e+7</td></tr>
<tr><td>Mass (kg)</td><td>11.802</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.858</td></tr>
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<tr><td>Min factor of safety</td><td>2.001</td></tr>
<tr><td>Max displacement global (mm)</td><td>14.532</td></tr>
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Table 7: Bookshelf-7

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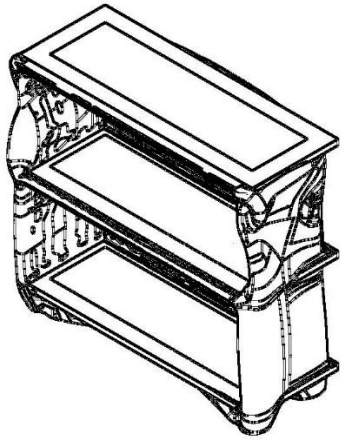
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>X+, Y+, Z+, X-, Y-, Z-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Ungrouped</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>3.785e+7</td></tr>
<tr><td>Mass (kg)</td><td>30.28</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.741</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>10.423</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.363</td></tr>
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Table 8: Bookshelf-8

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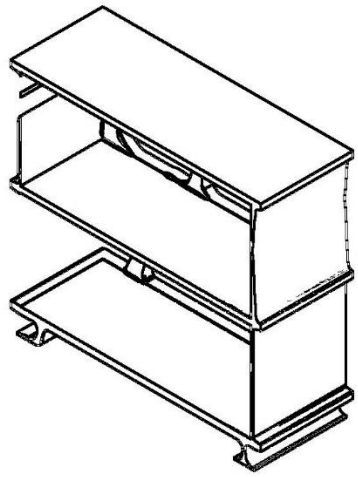
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Z</td></tr>
<tr><td>Manufacturing method</td><td>2 axis cutting</td></tr>
<tr><td>Visual similarity</td><td>Ungrouped</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>1.767e+7</td></tr>
<tr><td>Mass (kg)</td><td>14.132</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.756</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.055</td></tr>
<tr><td>Max displacement global (mm)</td><td>8.167</td></tr>
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3.2. DINING TABLE-1

Table 9: Dining Table-1.1

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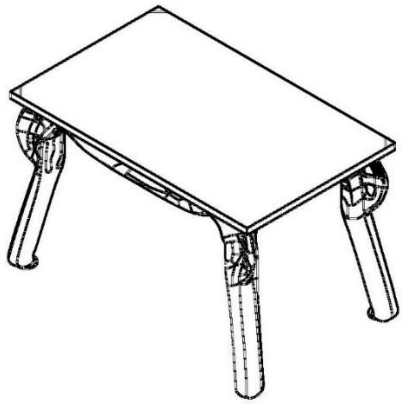
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>-</td></tr>
<tr><td>Manufacturing method</td><td>Unrestricted</td></tr>
<tr><td>Visual similarity</td><td>Group 4</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>8.972e+7</td></tr>
<tr><td>Mass (kg)</td><td>71.776</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.317</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>24.344</td></tr>
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Table 10: Dining Table-1.2

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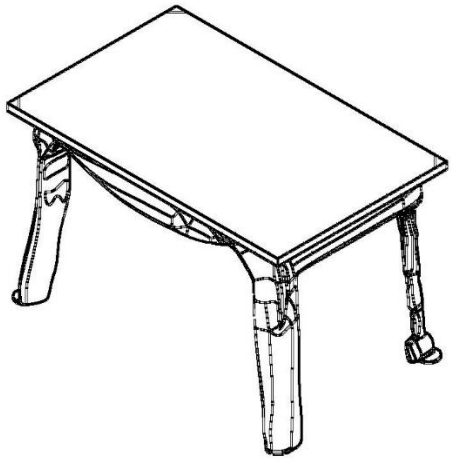
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
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<table>
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<tr><td>Orientation</td><td>Z+, Z-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Group 1</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>1.215e+8</td></tr>
<tr><td>Mass (kg)</td><td>97.178</td></tr>
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Table 11: Dining Table-1.3

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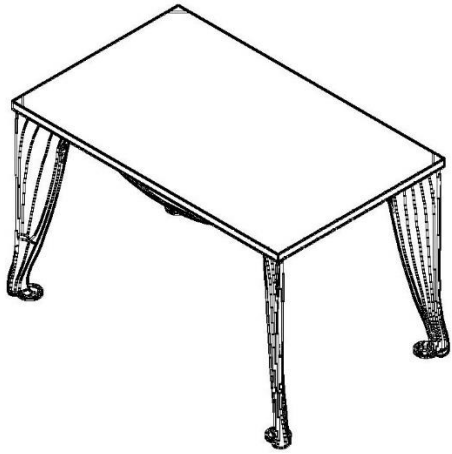
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
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<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Y-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Unique</td></tr>
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<tr><td>Volume (mm^3)</td><td>4.125e+7</td></tr>
<tr><td>Mass (kg)</td><td>33.004</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.373</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>20.699</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.215</td></tr>
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</table>

Table 12: Dining Table-1.4

Image Target for AR	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, X-** Manufacturing method **Die casting** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **3.816e+7** Mass (kg) **30.524** Max von Mises stress (MPa) **0.993** Factor of safety limit **2** Min factor of safety **7.776** Max displacement global (mm) **0.2**	

Table 13: Dining Table-1.5

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<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Z+</td></tr>
<tr><td>Manufacturing method</td><td>Additive</td></tr>
<tr><td>Visual similarity</td><td>Group 2</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>3.662e+7</td></tr>
<tr><td>Mass (kg)</td><td>29.299</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.028</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.55</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.305</td></tr>
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</table>

Table 14: Dining Table-1.6

Image Target for AR	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z-** Manufacturing method **Additive** Visual similarity **Group 3** Production volume (pcs.) **-** Volume (mm^3) **3.67e+7** Mass (kg) **29.364** Max von Mises stress (MPa) **2.296** Factor of safety limit **2** Min factor of safety **3.362** Max displacement global (mm) **0.26**	

Table 15: Dining Table-1.7

Image Target for AR	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y-** Manufacturing method **Additive** Visual similarity **Group 4** Production volume (pcs.) **-** Volume (mm^3) **3.61e+7** Mass (kg) **28.879** Max von Mises stress (MPa) **1.441** Factor of safety limit **2** Min factor of safety **5.357** Max displacement global (mm) **0.223**	

Table 16: Dining Table-1.8

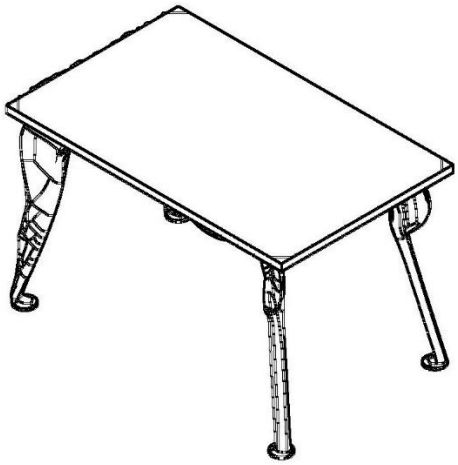
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) - Volume (mm^3) **3.711e+7** Mass (kg) **29.685** Max von Mises stress (MPa) **1.287** Factor of safety limit **2** Min factor of safety **5.999** Max displacement global (mm) **0.24**	

Table 17: Dining Table-1.9

Image Target for AR	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X-** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **3.644e+7** Mass (kg) **29.153** Max von Mises stress (MPa) **1.349** Factor of safety limit **2** Min factor of safety **5.724** Max displacement global (mm) **0.305**	

Table 18: Dining Table-1.10

<table>
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<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Unrestricted</td></tr>
<tr><td>Manufacturing method</td><td>5 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 3</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>3.621e+7</td></tr>
<tr><td>Mass (kg)</td><td>28.968</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.663</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>11.648</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.195</td></tr>
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Table 19: Dining Table-1.11

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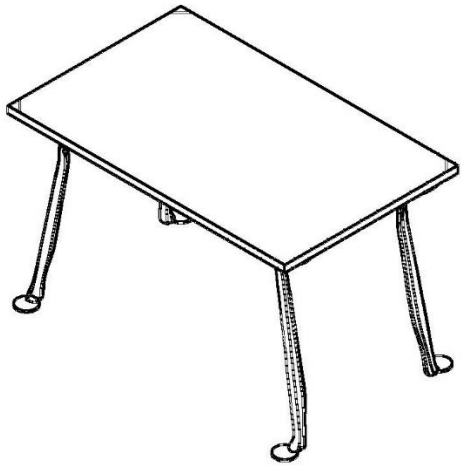
<tr><td colspan="2">  </td></tr>
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<tr><td>Orientation</td><td>Y+, Z+, Y-, Z-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 4</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>3.628e+7</td></tr>
<tr><td>Mass (kg)</td><td>29.028</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.487</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>5.193</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.402</td></tr>
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Table 20: Dining Table-1.12

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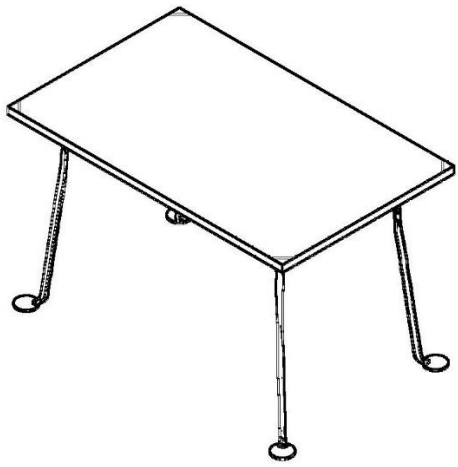
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>X+, Z+, X-, Z-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 1</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>8.386e+7</td></tr>
<tr><td>Mass (kg)</td><td>67.089</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.821</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.02</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.568</td></tr>
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Table 21: Dining Table-1.13

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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>X+, Y+, Z+, X-, Y-, Z-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 2</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>3.702e+7</td></tr>
<tr><td>Mass (kg)</td><td>29.614</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.965</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>8.002</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.315</td></tr>
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Table 22: Dining Table-1.14

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<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>X+, Y+, X-, Y-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 2</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>3.681e+7</td></tr>
<tr><td>Mass (kg)</td><td>29.447</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.487</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>5.193</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.455</td></tr>
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Table 23: Dining Table-1.15

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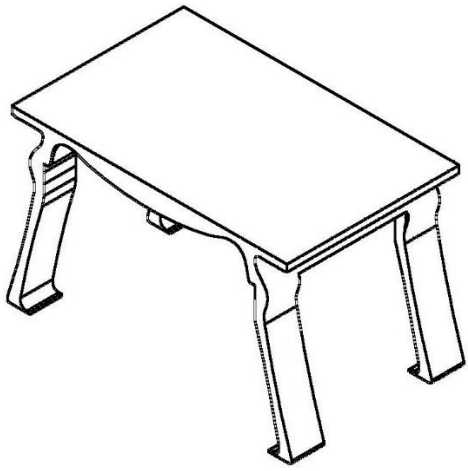
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Z</td></tr>
<tr><td>Manufacturing method</td><td>2 axis cutting</td></tr>
<tr><td>Visual similarity</td><td>Unique</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>7.48e+7</td></tr>
<tr><td>Mass (kg)</td><td>59.837</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.427</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>18.081</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.111</td></tr>
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3.3. DINING TABLE-2

Table 24: Dining Table-2.1

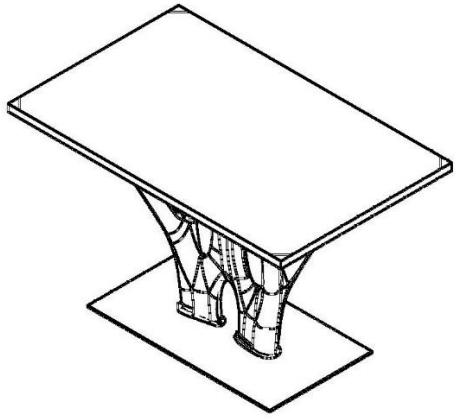
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation - Manufacturing method **Unrestricted** Visual similarity **Group 2** Production volume (pcs.) - Volume (mm^3) **4.22e+7** Mass (kg) **33.759** Max von Mises stress (MPa) **0.346** Factor of safety limit **2** Min factor of safety **22.298** Max displacement global (mm) **0.105**	

Table 25: Dining Table-2.2

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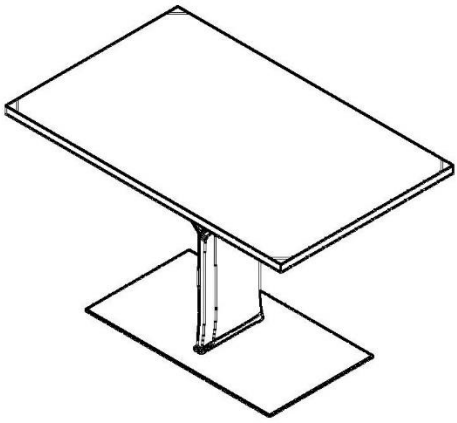
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Z+, Z-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Unique</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>4.209e+7</td></tr>
<tr><td>Mass (kg)</td><td>33.674</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.289</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>26.73</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.232</td></tr>
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Table 26: Dining Table-2.3

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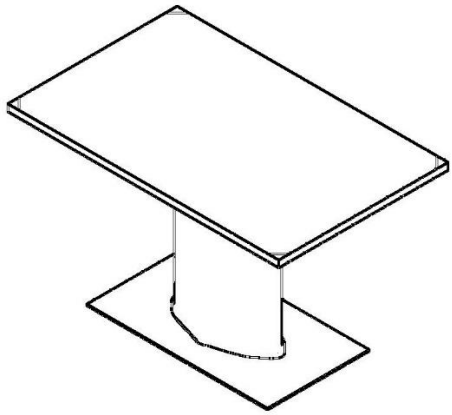
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Y-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Group 1</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>7.732e+7</td></tr>
<tr><td>Mass (kg)</td><td>61.859</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.499</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>5.15</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.857</td></tr>
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Table 27: Dining Table-2.4

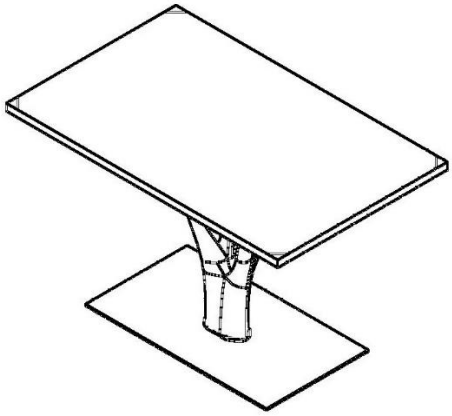
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, X-** Manufacturing method **Die casting** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **4.266e+7** Mass (kg) **34.126** Max von Mises stress (MPa) **0.34** Factor of safety limit **2** Min factor of safety **22.68** Max displacement global (mm) **0.15**	

Table 28: Dining Table-2.5

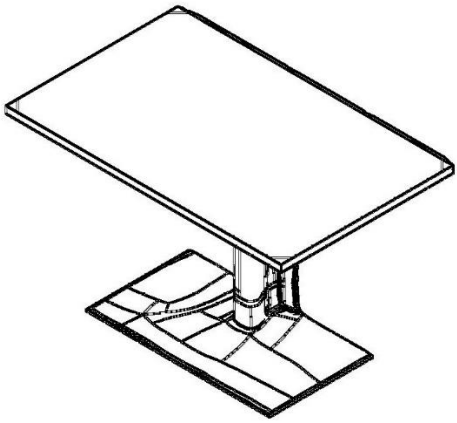
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z+** Manufacturing method **Additive** Visual similarity **Group 3** Production volume (pcs.) **-** Volume (mm^3) **4.247e+7** Mass (kg) **33.973** Max von Mises stress (MPa) **1.176** Factor of safety limit **2** Min factor of safety **6.563** Max displacement global (mm) **1.57**	

Table 29: Dining Table-2.6

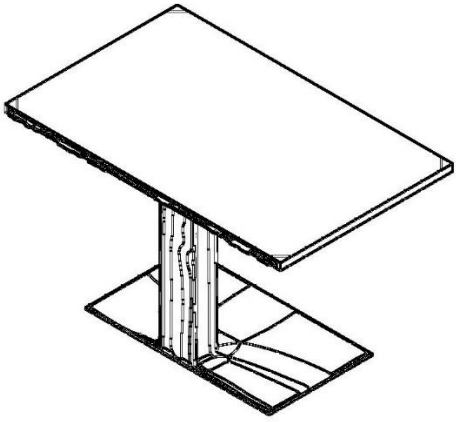
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation Z- Manufacturing method **Additive** Visual similarity **Group 4** Production volume (pcs.) - Volume (mm^3) 4.294e+7 Mass (kg) 34.352 Max von Mises stress (MPa) 2.424 Factor of safety limit 2 Min factor of safety 3.185 Max displacement global (mm) 3.429	

Table 30: Dining Table-2.7

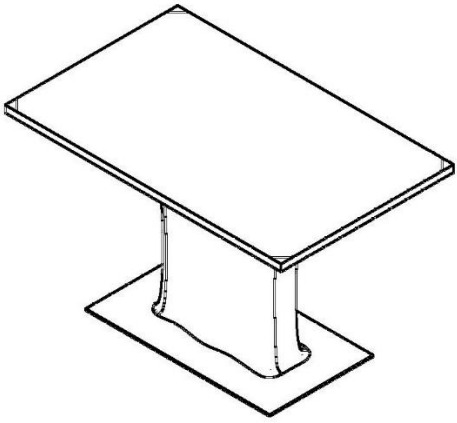
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y+** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **9.789e+7** Mass (kg) **78.311** Max von Mises stress (MPa) **0.556** Factor of safety limit **2** Min factor of safety **13.873** Max displacement global (mm) **0.118**	

Table 31: Dining Table-2.8

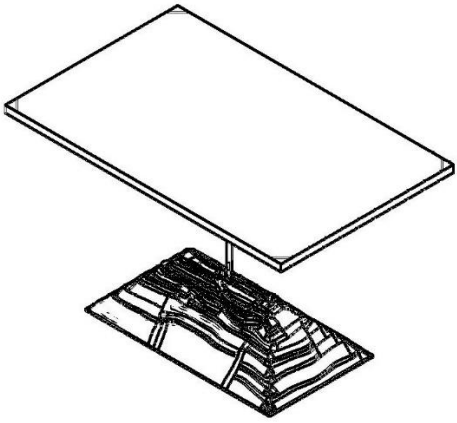
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y-** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **6.277e+7** Mass (kg) **50.219** Max von Mises stress (MPa) **5.439** Factor of safety limit **2** Min factor of safety **1.419** Max displacement global (mm) **5.53**	

Table 32: Dining Table-2.9

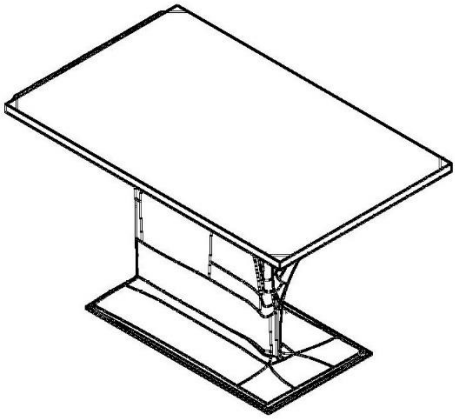
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+** Manufacturing method **Additive** Visual similarity **Group 1** Production volume (pcs.) **-** Volume (mm^3) **4.359e+7** Mass (kg) **34.874** Max von Mises stress (MPa) **0.708** Factor of safety limit **2** Min factor of safety **10.911** Max displacement global (mm) **0.164**	

Table 33: Dining Table-2.10

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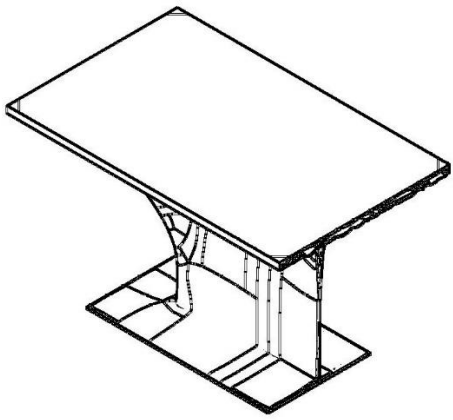
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>X-</td></tr>
<tr><td>Manufacturing method</td><td>Additive</td></tr>
<tr><td>Visual similarity</td><td>Group 2</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>4.345e+7</td></tr>
<tr><td>Mass (kg)</td><td>34.76</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.09</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>7.085</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.165</td></tr>
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Table 34: Dining Table-2.11

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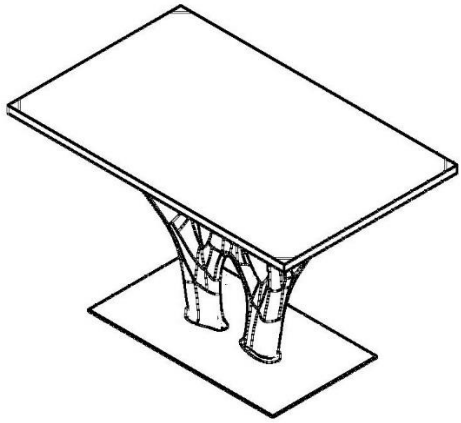
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Unrestricted</td></tr>
<tr><td>Manufacturing method</td><td>5 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 3</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>4.256e+7</td></tr>
<tr><td>Mass (kg)</td><td>34.044</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.338</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>22.838</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.109</td></tr>
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</td><td></td></tr>
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Table 35: Dining Table-2.12

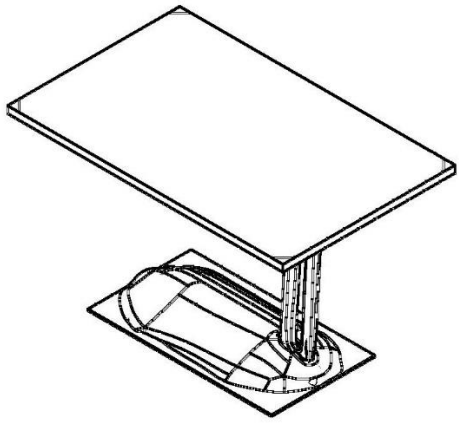
<table>
<tr><td colspan="2">Image Target for AR</td></tr>
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Z+, Y-, Z-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Unique</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>6.467e+7</td></tr>
<tr><td>Mass (kg)</td><td>51.735</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.855</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.002</td></tr>
<tr><td>Max displacement global (mm)</td><td>14.699</td></tr>
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Table 36: Dining Table-2.13

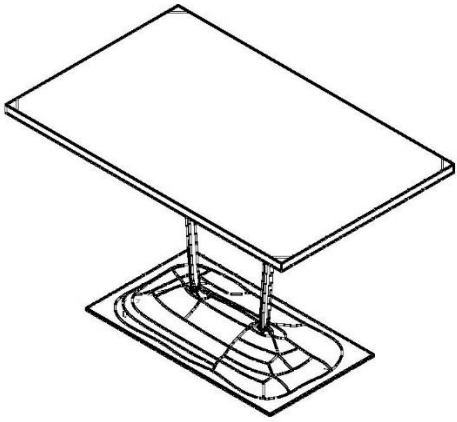
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, Z+, X-, Z-** Manufacturing method **3 axis milling** Visual similarity **Group 3** Production volume (pcs.) **-** Volume (mm^3) **5.996e+7** Mass (kg) **47.971** Max von Mises stress (MPa) **1.618** Factor of safety limit **2** Min factor of safety **4.772** Max displacement global (mm) **1.3**	

Table 37: Dining Table-2.14

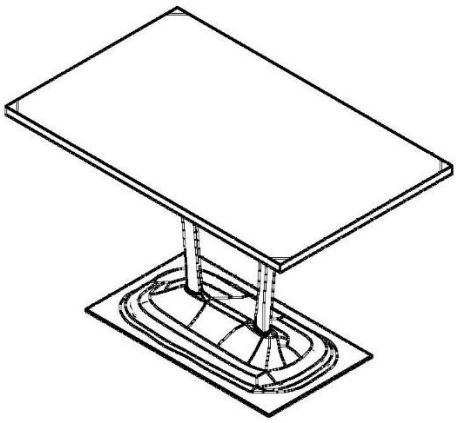
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, Y+, Z+, X-, Y-, Z-** Manufacturing method **3 axis milling** Visual similarity **Group 3** Production volume (pcs.) **-** Volume (mm^3) **6.037e+7** Mass (kg) **48.298** Max von Mises stress (MPa) **0.631** Factor of safety limit **2** Min factor of safety **12.23** Max displacement global (mm) **0.356**	

Table 38: Dining Table-2.15

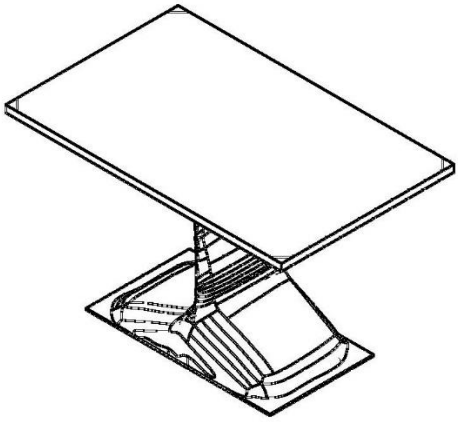
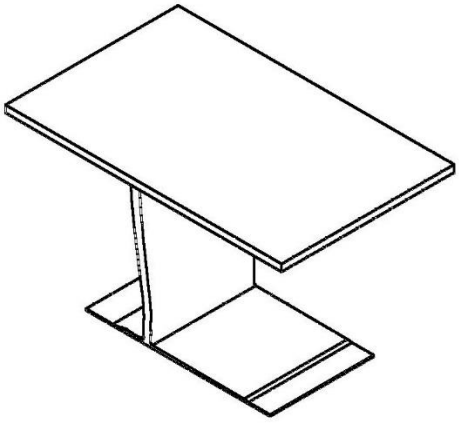
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation X+, Y+, X-, Y- Manufacturing method 3 axis milling Visual similarity Group 1 Production volume (pcs.) - Volume (mm^3) 9.272e+7 Mass (kg) 74.179 Max von Mises stress (MPa) 0.282 Factor of safety limit 2 Min factor of safety 27.358 Max displacement global (mm) 0.4	

Table 39: Dining Table-2.16

Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation Z Manufacturing method **2 axis cutting** Visual similarity **Group 2** Production volume (pcs.) - Volume (mm^3) 4.172e+7 Mass (kg) 33.373 Max von Mises stress (MPa) 2.394 Factor of safety limit 2 Min factor of safety 3.225 Max displacement global (mm) 27.328	

3.4. ROCKING CHAIR

Table 40: Rocking Chair-1

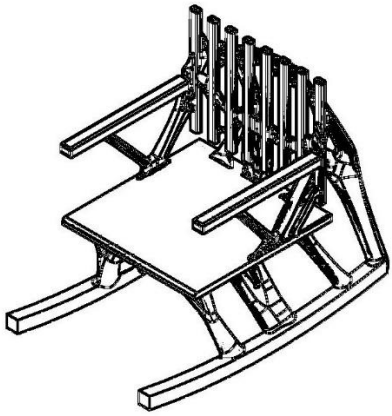
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation - Manufacturing method **Unrestricted** Visual similarity **Group 3** Production volume (pcs.) - Volume (mm^3) **2.029e+7** Mass (kg) **16.234** Max von Mises stress (MPa) **0.292** Factor of safety limit **2** Min factor of safety **26.412** Max displacement global (mm) **0.103**	

Table 41: Rocking Chair-2

<table>
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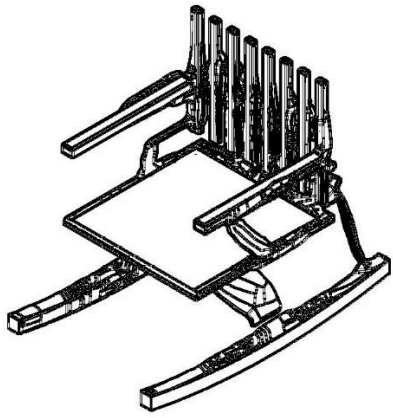
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Z+, Z-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Unique</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>1.95e+7</td></tr>
<tr><td>Mass (kg)</td><td>15.598</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.636</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.123</td></tr>
<tr><td>Max displacement global (mm)</td><td>5.731</td></tr>
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Table 42: Rocking Chair-3

<table>
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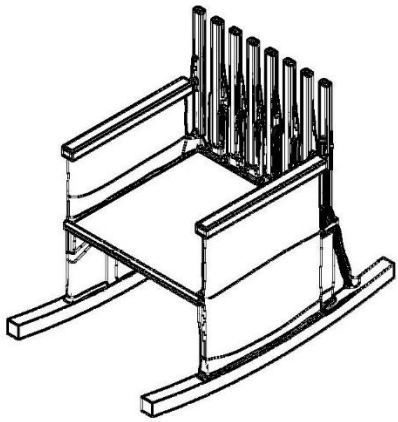
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Y-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Group 2</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>2.49e+7</td></tr>
<tr><td>Mass (kg)</td><td>19.923</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.817</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.022</td></tr>
<tr><td>Max displacement global (mm)</td><td>2.603</td></tr>
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Table 43: Rocking Chair-4

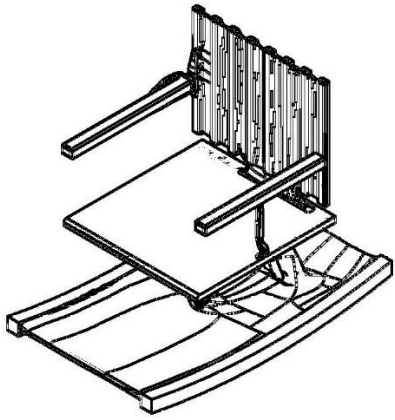
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, X-** Manufacturing method **Die casting** Visual similarity **Group 1** Production volume (pcs.) **-** Volume (mm^3) **2.768e+7** Mass (kg) **22.147** Max von Mises stress (MPa) **1.796** Factor of safety limit **2** Min factor of safety **4.298** Max displacement global (mm) **1.998**	

Table 44: Rocking Chair-5

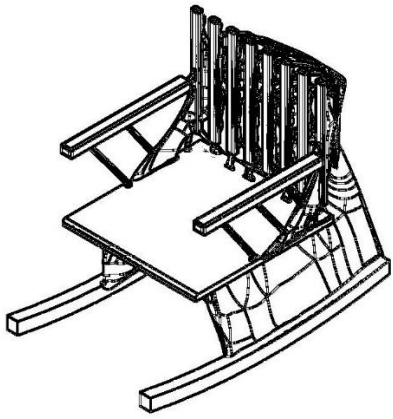
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z+** Manufacturing method **Additive** Visual similarity **Group 1** Production volume (pcs.) **-** Volume (mm^3) **2.146e+7** Mass (kg) **17.172** Max von Mises stress (MPa) **0.66** Factor of safety limit **2** Min factor of safety **11.69** Max displacement global (mm) **0.197**	

Table 45: Rocking Chair-6

<table>
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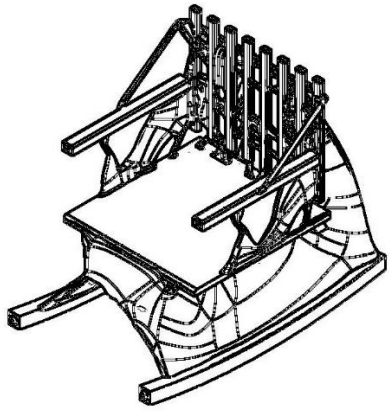
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Z-</td></tr>
<tr><td>Manufacturing method</td><td>Additive</td></tr>
<tr><td>Visual similarity</td><td>Unique</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>2.172e+7</td></tr>
<tr><td>Mass (kg)</td><td>17.375</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.014</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>7.616</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.138</td></tr>
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Table 46: Rocking Chair-7

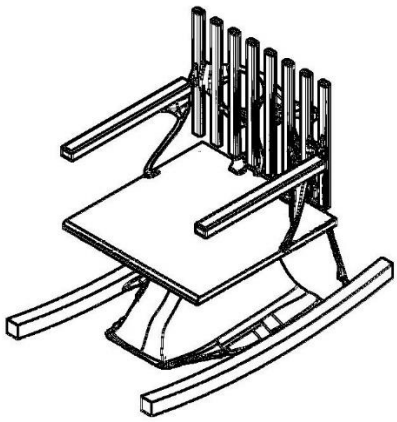
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y+** Manufacturing method **Additive** Visual similarity **Group 2** Production volume (pcs.) **-** Volume (mm^3) **4.537e+7** Mass (kg) **36.293** Max von Mises stress (MPa) **3.859** Factor of safety limit **2** Min factor of safety **2.001** Max displacement global (mm) **4.806**	

Table 47: Rocking Chair-8

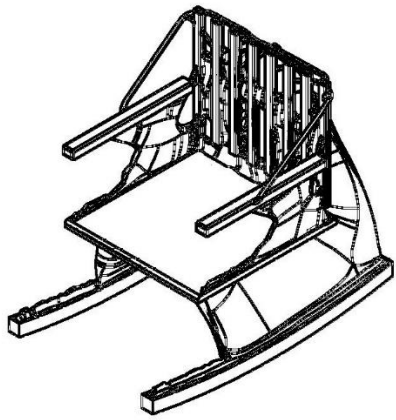
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y-** Manufacturing method **Additive** Visual similarity **Group 3** Production volume (pcs.) **-** Volume (mm^3) **2.088e+7** Mass (kg) **16.706** Max von Mises stress (MPa) **1.268** Factor of safety limit **2** Min factor of safety **6.086** Max displacement global (mm) **0.189**	

Table 48: Rocking Chair-9

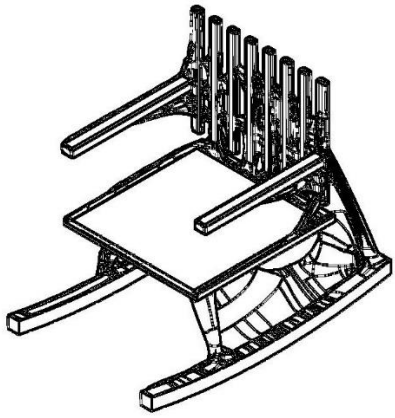
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **2.05e+7** Mass (kg) **16.401** Max von Mises stress (MPa) **1.334** Factor of safety limit **2** Min factor of safety **5.788** Max displacement global (mm) **0.596**	

Table 49: Rocking Chair-10

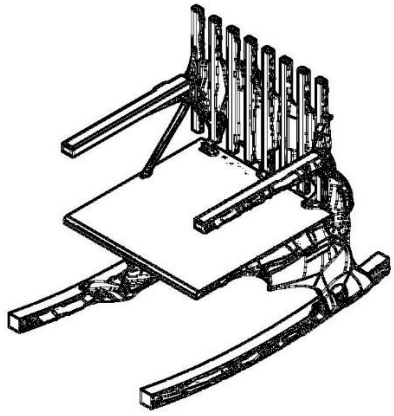
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X-** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **2.101e+7** Mass (kg) **16.805** Max von Mises stress (MPa) **2.014** Factor of safety limit **2** Min factor of safety **3.834** Max displacement global (mm) **1.835**	

Table 50: Rocking Chair-11

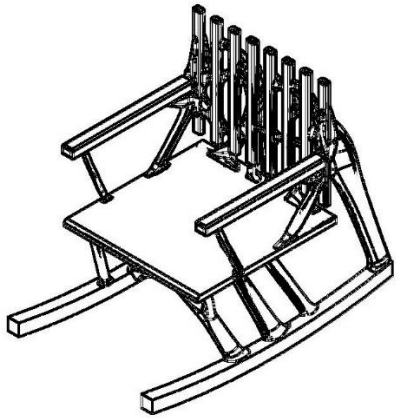
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation Unrestricted Manufacturing method 5 axis milling Visual similarity Group 5 Production volume (pcs.) - Volume (mm^3) 2.061e+7 Mass (kg) 16.489 Max von Mises stress (MPa) 0.321 Factor of safety limit 2 Min factor of safety 24.052 Max displacement global (mm) 0.146	

Table 51: Rocking Chair-12

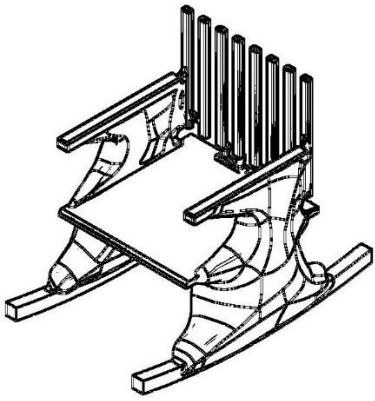
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y+, Z+, Y-, Z-** Manufacturing method **3 axis milling** Visual similarity **Group 1** Production volume (pcs.) **-** Volume (mm^3) **5.462e+7** Mass (kg) **43.696** Max von Mises stress (MPa) **3.857** Factor of safety limit **2** Min factor of safety **2.001** Max displacement global (mm) **11.42**	

Table 52: Rocking Chair-13

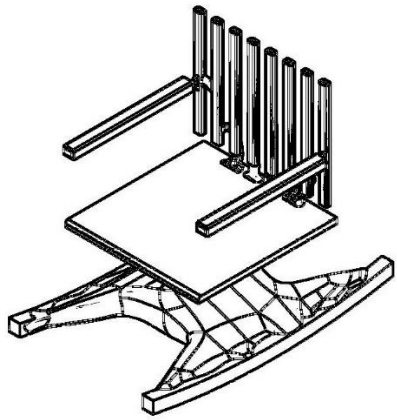
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation X+, Z+, X-, Z- Manufacturing method 3 axis milling Visual similarity Group 3 Production volume (pcs.) - Volume (mm^3) 3.961e+7 Mass (kg) 31.69 Max von Mises stress (MPa) 3.86 Factor of safety limit 2 Min factor of safety 2 Max displacement global (mm) 16.695	

Table 53: Rocking Chair-14

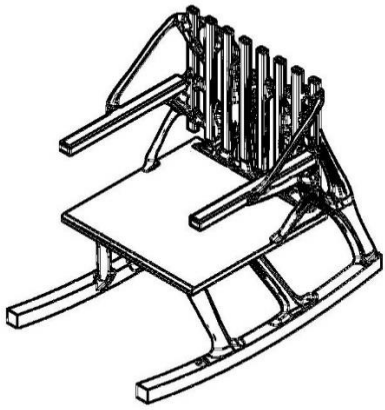
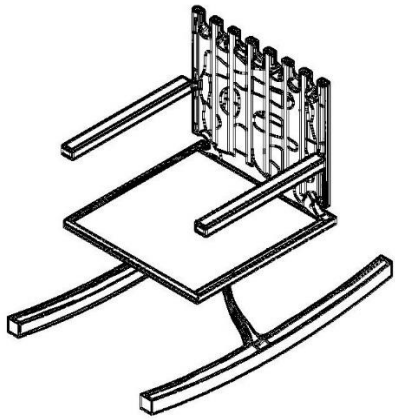
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, Y+, Z+, X-, Y-, Z-** Manufacturing method **3 axis milling** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **2.051e+7** Mass (kg) **16.405** Max von Mises stress (MPa) **0.599** Factor of safety limit **2** Min factor of safety **12.882** Max displacement global (mm) **0.398**	

Table 54: Rocking Chair-15

Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, Y+, X-, Y-** Manufacturing method **3 axis milling** Visual similarity **Group 4** Production volume (pcs.) **-** Volume (mm^3) **2.305e+7** Mass (kg) **18.436** Max von Mises stress (MPa) **3.853** Factor of safety limit **2** Min factor of safety **2.003** Max displacement global (mm) **11.9**	

3.5. SCHOOL TABLE

Table 55: School Table-1

<table>
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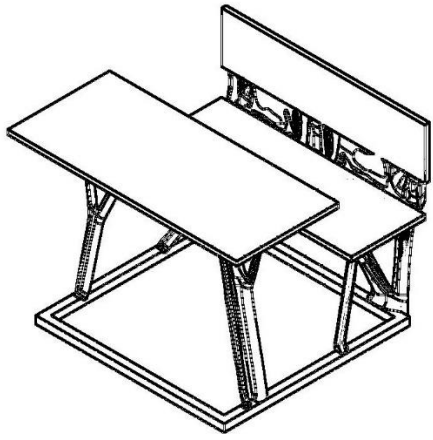
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>-</td></tr>
<tr><td>Manufacturing method</td><td>Unrestricted</td></tr>
<tr><td>Visual similarity</td><td>Unique</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>2.605e+7</td></tr>
<tr><td>Mass (kg)</td><td>20.837</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.195</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>6.461</td></tr>
<tr><td>Max displacement global (mm)</td><td>2.202</td></tr>
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</table>

Table 56: School Table-2

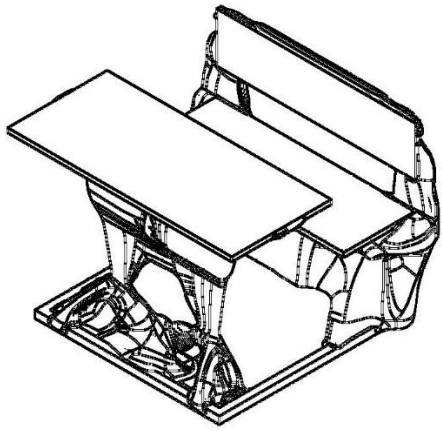
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z+, Z-** Manufacturing method **Die casting** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **6.851e+7** Mass (kg) **54.808** Max von Mises stress (MPa) **3.251** Factor of safety limit **2** Min factor of safety **2.375** Max displacement global (mm) **4.711**	

Table 57: School Table-3

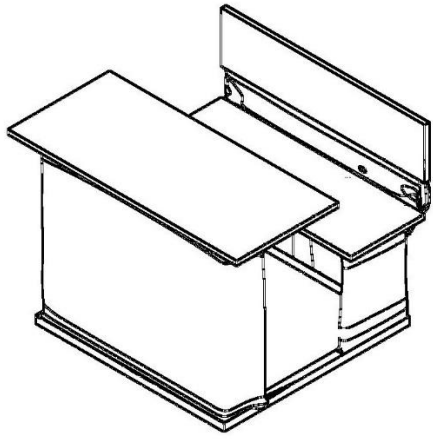
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y+, Y-** Manufacturing method **Die casting** Visual similarity **Group 4** Production volume (pcs.) **-** Volume (mm^3) **4.123e+7** Mass (kg) **32.985** Max von Mises stress (MPa) **0.782** Factor of safety limit **2** Min factor of safety **9.869** Max displacement global (mm) **0.896**	

Table 58: School Table-4

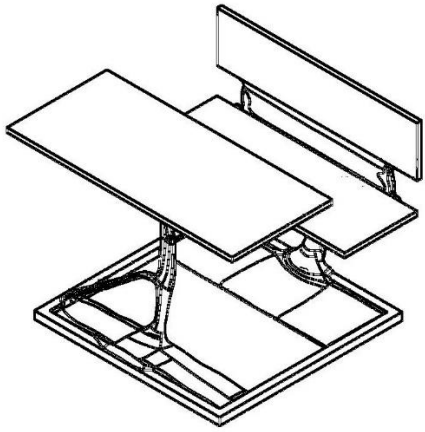
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation X+, X- Manufacturing method Die casting Visual similarity Group 3 Production volume (pcs.) - Volume (mm^3) 2.877e+7 Mass (kg) 23.014 Max von Mises stress (MPa) 3.76 Factor of safety limit 2 Min factor of safety 2.053 Max displacement global (mm) 19.708	

Table 59: School Table-5

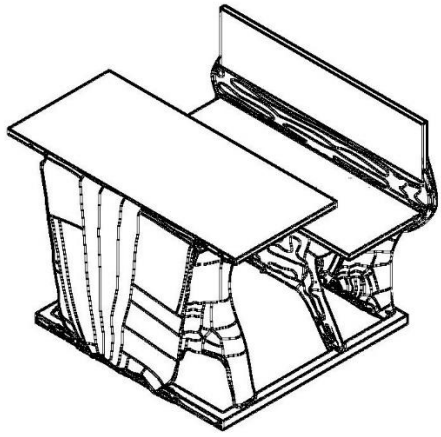
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z+** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **6.704e+7** Mass (kg) **53.634** Max von Mises stress (MPa) **1.152** Factor of safety limit **2** Min factor of safety **6.704** Max displacement global (mm) **0.752**	

Table 60: School Table-6

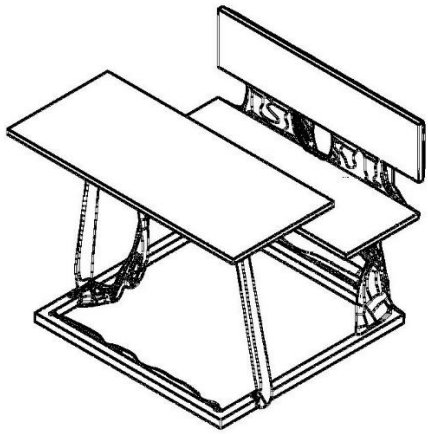
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation Z- Manufacturing method Additive Visual similarity Unique Production volume (pcs.) - Volume (mm^3) 2.618e+7 Mass (kg) 20.944 Max von Mises stress (MPa) 1.714 Factor of safety limit 2 Min factor of safety 4.505 Max displacement global (mm) 9.443	

Table 61: School Table-7

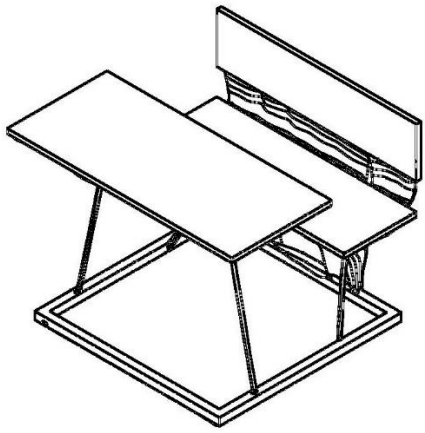
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y+** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) - Volume (mm^3) 4.299e+7 Mass (kg) 34.392 Max von Mises stress (MPa) 3.86 Factor of safety limit 2 Min factor of safety 2 Max displacement global (mm) 6.665	

Table 62: School Table-8

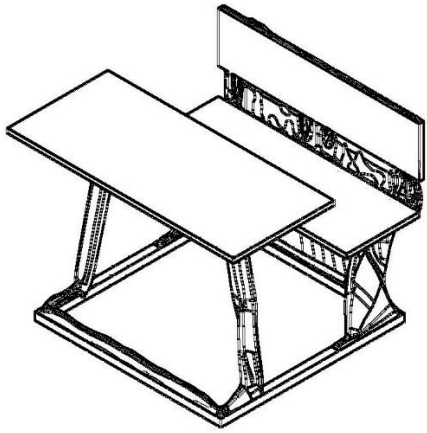
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y-** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **2.614e+7** Mass (kg) **20.914** Max von Mises stress (MPa) **1.482** Factor of safety limit **2** Min factor of safety **5.208** Max displacement global (mm) **6.791**	

Table 63: School Table-9

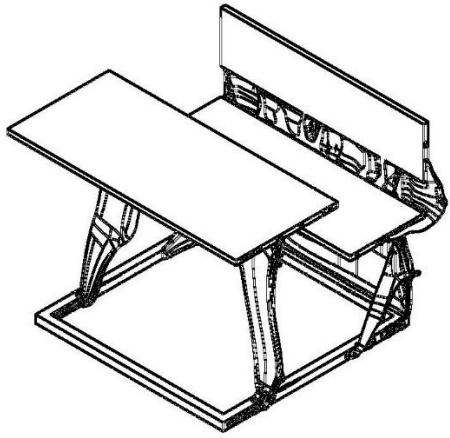
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **2.702e+7** Mass (kg) **21.62** Max von Mises stress (MPa) **1.6** Factor of safety limit **2** Min factor of safety **4.825** Max displacement global (mm) **6.007**	

Table 64: School Table-10

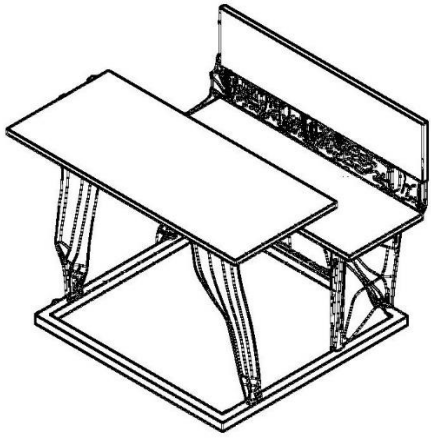
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X-** Manufacturing method **Additive** Visual similarity **Group 1** Production volume (pcs.) **-** Volume (mm^3) **2.807e+7** Mass (kg) **22.459** Max von Mises stress (MPa) **1.441** Factor of safety limit **2** Min factor of safety **5.356** Max displacement global (mm) **5.722**	

Table 65: School Table-11

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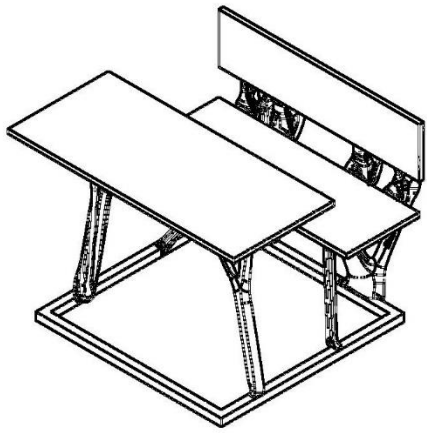
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
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<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Unrestricted</td></tr>
<tr><td>Manufacturing method</td><td>5 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 2</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>2.619e+7</td></tr>
<tr><td>Mass (kg)</td><td>20.95</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.061</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>7.273</td></tr>
<tr><td>Max displacement global (mm)</td><td>2.651</td></tr>
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Table 66: School Table-12

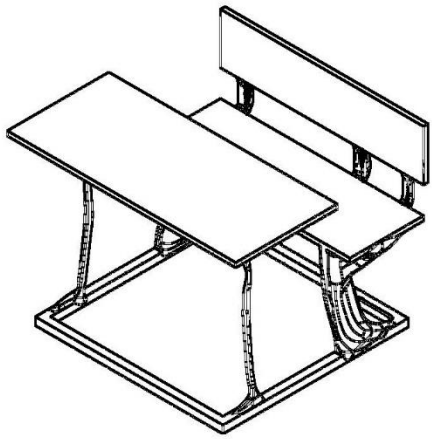
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation Y+, Z+, Y-, Z- Manufacturing method 3 axis milling Visual similarity Group 2 Production volume (pcs.) - Volume (mm^3) 2.698e+7 Mass (kg) 21.581 Max von Mises stress (MPa) 3.86 Factor of safety limit 2 Min factor of safety 2 Max displacement global (mm) 52.514	

Table 67: School Table-13

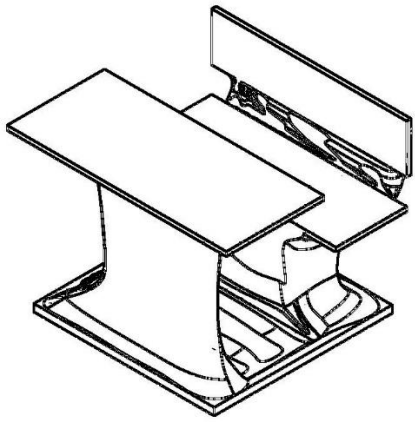
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation X+, Z+, X-, Z- Manufacturing method 3 axis milling Visual similarity Group 5 Production volume (pcs.) - Volume (mm^3) 9.469e+7 Mass (kg) 75.753 Max von Mises stress (MPa) 1.085 Factor of safety limit 2 Min factor of safety 7.114 Max displacement global (mm) 1.139	

Table 68: School Table-14

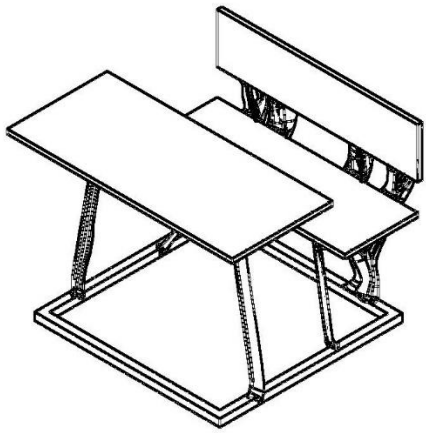
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation X+, Y+, Z+, X-, Y-, Z- Manufacturing method 3 axis milling Visual similarity Group 1 Production volume (pcs.) - Volume (mm^3) 2.644e+7 Mass (kg) 21.155 Max von Mises stress (MPa) 1.698 Factor of safety limit 2 Min factor of safety 4.547 Max displacement global (mm) 7.997	

Table 69: School Table-15

<table>
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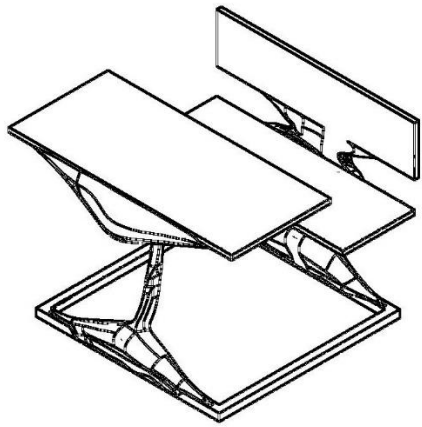
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>X+, Y+, X-, Y-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 1</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>4.663e+7</td></tr>
<tr><td>Mass (kg)</td><td>37.301</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.857</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.002</td></tr>
<tr><td>Max displacement global (mm)</td><td>20.165</td></tr>
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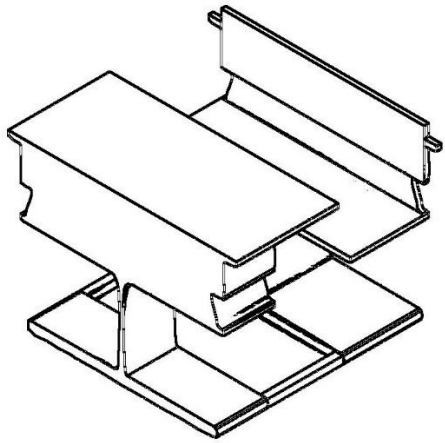
Table 70: School Table-16

Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z** Manufacturing method **2 axis cutting** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **7.703e+7** Mass (kg) **61.627** Max von Mises stress (MPa) **2.666** Factor of safety limit **2** Min factor of safety **2.896** Max displacement global (mm) **3.093**	

3.6. TROLLEY

Table 71: Trolley-1

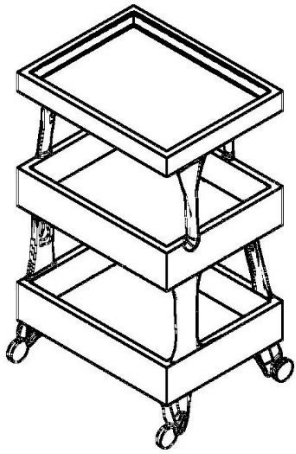
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation Z+, Z- Manufacturing method Die casting Visual similarity Group 4 Production volume (pcs.) - Volume (mm^3) 1.647e+7 Mass (kg) 13.173 Max von Mises stress (MPa) 0.169 Factor of safety limit 2 Min factor of safety 45.793 Max displacement global (mm) 0.048	

Table 72: Trolley-2

<table>
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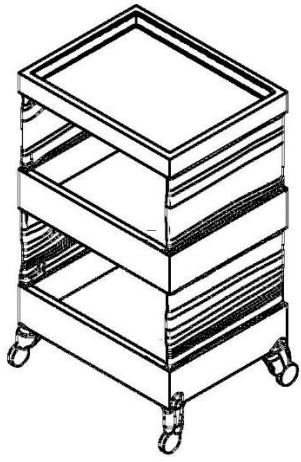
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Y-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Group 1</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>2.134e+7</td></tr>
<tr><td>Mass (kg)</td><td>17.072</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>0.124</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>62.16</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.035</td></tr>
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Table 73: Trolley-3

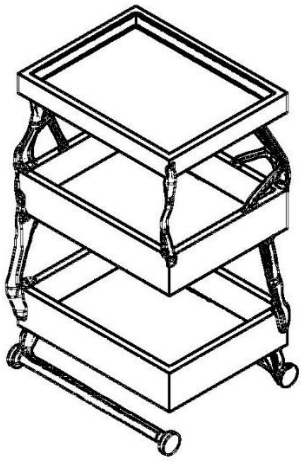
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, X-** Manufacturing method **Die casting** Visual similarity **Group 2** Production volume (pcs.) **-** Volume (mm^3) **1.625e+7** Mass (kg) **12.998** Max von Mises stress (MPa) **0.346** Factor of safety limit **2** Min factor of safety **22.29** Max displacement global (mm) **0.196**	

Table 74: Trolley-4

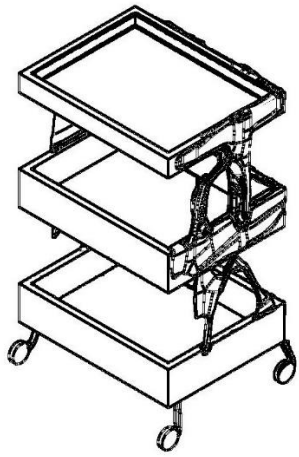
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation Z+ Manufacturing method Additive Visual similarity Unique Production volume (pcs.) - Volume (mm^3) 1.73e+7 Mass (kg) 13.838 Max von Mises stress (MPa) 3.852 Factor of safety limit 2 Min factor of safety 2.004 Max displacement global (mm) 9.926	

Table 75: Trolley-5

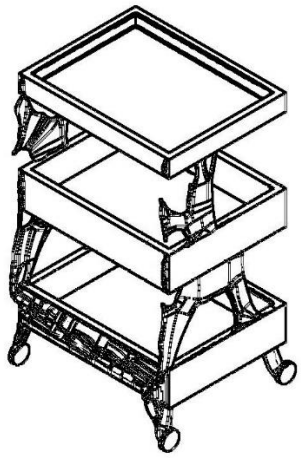
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z-** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **1.62e+7** Mass (kg) **12.959** Max von Mises stress (MPa) **0.438** Factor of safety limit **2** Min factor of safety **17.616** Max displacement global (mm) **0.088**	

Table 76: Trolley-6

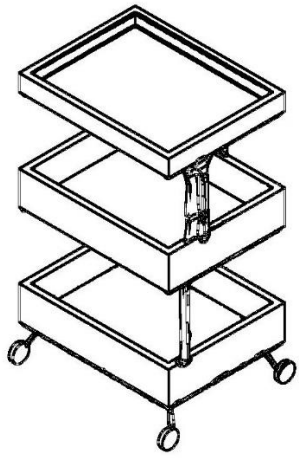
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y+** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **2.332e+7** Mass (kg) **18.658** Max von Mises stress (MPa) **3.689** Factor of safety limit **2** Min factor of safety **2.093** Max displacement global (mm) **3.177**	

Table 77: Trolley-7

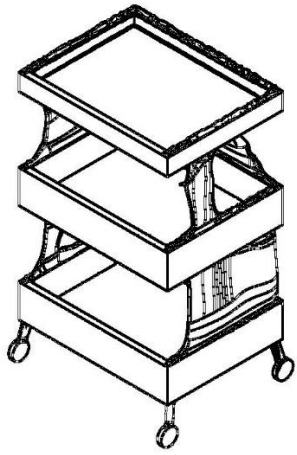
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Y-** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **1.62e+7** Mass (kg) **12.959** Max von Mises stress (MPa) **0.639** Factor of safety limit **2** Min factor of safety **12.085** Max displacement global (mm) **0.097**	

Table 78: Trolley-8

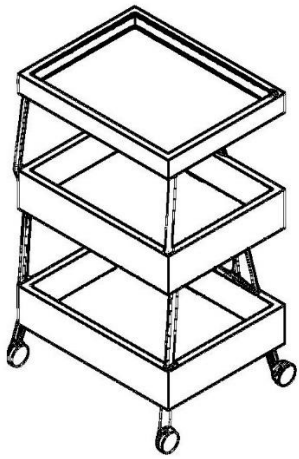
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+** Manufacturing method **Additive** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **1.638e+7** Mass (kg) **13.1** Max von Mises stress (MPa) **0.985** Factor of safety limit **2** Min factor of safety **7.839** Max displacement global (mm) **0.146**	

Table 79: Trolley-9

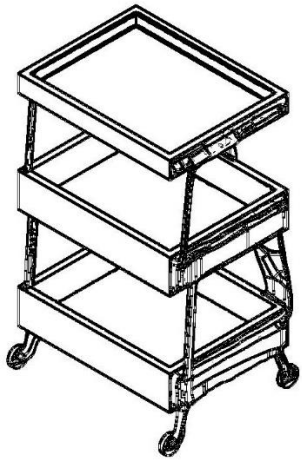
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X-** Manufacturing method **Additive** Visual similarity **Group 1** Production volume (pcs.) **-** Volume (mm^3) **1.622e+7** Mass (kg) **12.973** Max von Mises stress (MPa) **1.061** Factor of safety limit **2** Min factor of safety **7.274** Max displacement global (mm) **0.133**	

Table 80: Trolley-10

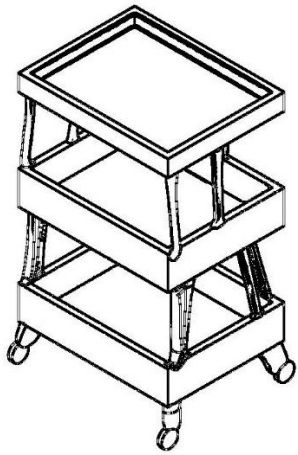
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Unrestricted** Manufacturing method **5 axis milling** Visual similarity **Group 3** Production volume (pcs.) **-** Volume (mm^3) **1.618e+7** Mass (kg) **12.941** Max von Mises stress (MPa) **0.212** Factor of safety limit **2** Min factor of safety **36.351** Max displacement global (mm) **0.047**	

Table 81: Trolley-11

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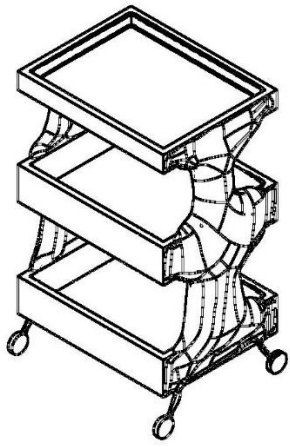
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Z+, Y-, Z-</td></tr>
<tr><td>Manufacturing method</td><td>3 axis milling</td></tr>
<tr><td>Visual similarity</td><td>Group 3</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>2.365e+7</td></tr>
<tr><td>Mass (kg)</td><td>18.92</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.716</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.078</td></tr>
<tr><td>Max displacement global (mm)</td><td>0.096</td></tr>
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Table 82: Trolley-12

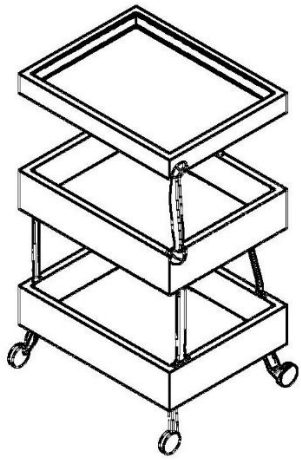
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... MDF Medium Density Fiberboard Orientation X+, Z+, X-, Z- Manufacturing method 3 axis milling Visual similarity Group 2 Production volume (pcs.) - Volume (mm^3) 1.893e+7 Mass (kg) 15.142 Max von Mises stress (MPa) 3.859 Factor of safety limit 2 Min factor of safety 2.001 Max displacement global (mm) 10.254	

Table 83: Trolley-13

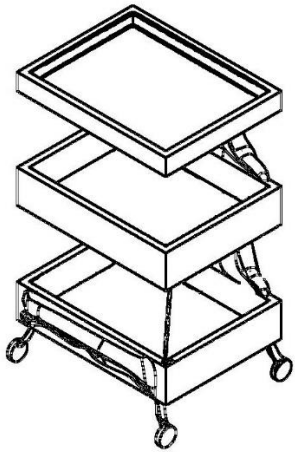
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, Y+, X-, Y-** Manufacturing method **3 axis milling** Visual similarity **Group 4** Production volume (pcs.) **-** Volume (mm^3) **2.315e+7** Mass (kg) **18.523** Max von Mises stress (MPa) **2.093** Factor of safety limit **2** Min factor of safety **3.688** Max displacement global (mm) **1.711**	

Table 84: Trolley-14

Image Target for AR	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z** Manufacturing method **2 axis cutting** Visual similarity **Group 1** Production volume (pcs.) **-** Volume (mm^3) **3.061e+7** Mass (kg) **24.491** Max von Mises stress (MPa) **0.126** Factor of safety limit **2** Min factor of safety **61.443** Max displacement global (mm) **0.034**	

3.7. TV UNIT

Table 85: TV Unit-1

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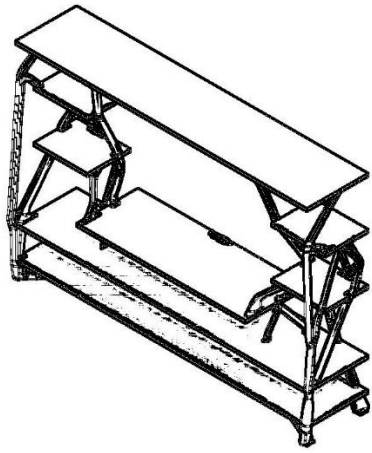
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>-</td></tr>
<tr><td>Manufacturing method</td><td>Unrestricted</td></tr>
<tr><td>Visual similarity</td><td>Group 3</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>7.462e+7</td></tr>
<tr><td>Mass (kg)</td><td>59.697</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.757</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>4.394</td></tr>
<tr><td>Max displacement global (mm)</td><td>2.593</td></tr>
</table>
</td><td></td></tr>
</table>

Table 86: TV Unit-2

<table>
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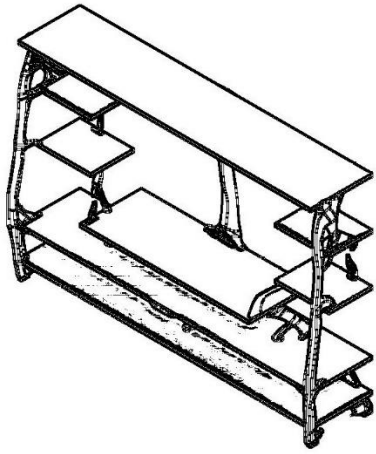
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Z+, Z-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Unique</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>8.351e+7</td></tr>
<tr><td>Mass (kg)</td><td>66.808</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>3.799</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>2.032</td></tr>
<tr><td>Max displacement global (mm)</td><td>3.26</td></tr>
</table>
</td><td></td></tr>
</table>

Table 87: TV Unit-3

<table>
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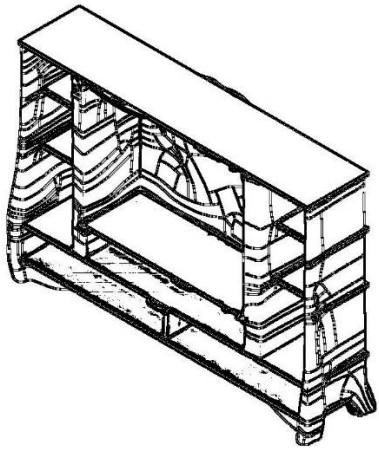
<tr><td colspan="2">  </td></tr>
<tr><td>Properties for The Outcome Design</td><td>QR for 3D Pdf of The Design</td></tr>
<tr><td>
<table>
<tr><td>Materi...</td><td>MDF Medium Density Fiberboard</td></tr>
<tr><td>Orientation</td><td>Y+, Y-</td></tr>
<tr><td>Manufacturing method</td><td>Die casting</td></tr>
<tr><td>Visual similarity</td><td>Group 1</td></tr>
<tr><td>Production volume (pcs.)</td><td>-</td></tr>
<tr><td>Volume (mm^3)</td><td>2.267e+8</td></tr>
<tr><td>Mass (kg)</td><td>181.322</td></tr>
<tr><td>Max von Mises stress (MPa)</td><td>1.526</td></tr>
<tr><td>Factor of safety limit</td><td>2</td></tr>
<tr><td>Min factor of safety</td><td>5.059</td></tr>
<tr><td>Max displacement global (mm)</td><td>1.18</td></tr>
</table>
</td><td></td></tr>
</table>

Table 88: TV Unit-4

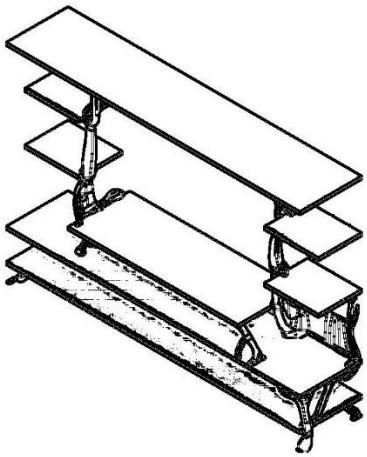
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **X+, X-** Manufacturing method **Die casting** Visual similarity **Unique** Production volume (pcs.) - Volume (mm^3) **1.01e+8** Mass (kg) **80.774** Max von Mises stress (MPa) **3.022** Factor of safety limit **2** Min factor of safety **2.554** Max displacement global (mm) **6.663**	

Table 89: TV Unit-5

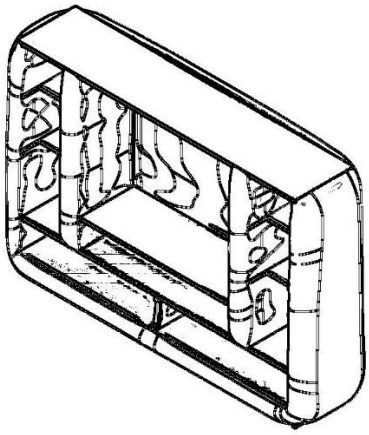
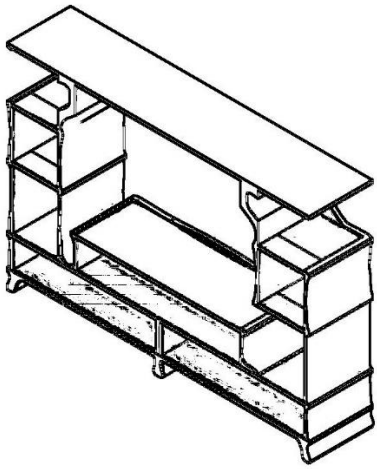
Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Unrestricted** Manufacturing method **5 axis milling** Visual similarity **Ungrouped** Production volume (pcs.) - Volume (mm^3) **6.719e+8** Mass (kg) **537.555** Max von Mises stress (MPa) **0.798** Factor of safety limit **2** Min factor of safety **9.675** Max displacement global (mm) **0.864**	

Table 90: TV Unit-6

Image Target for AR	
	
Properties for The Outcome Design	QR for 3D Pdf of The Design
Materi... **MDF Medium Density Fiberboard** Orientation **Z** Manufacturing method **2 axis cutting** Visual similarity **Unique** Production volume (pcs.) **-** Volume (mm^3) **1.268e+8** Mass (kg) **101.418** Max von Mises stress (MPa) **3.851** Factor of safety limit **2** Min factor of safety **2.005** Max displacement global (mm) **2.584**	

4. CONCLUSION

The following can be said about the future potential of AR:

- Augmented reality; Today, it is a technology that affects human life and has a great importance. On the other hand, it cannot be said that augmented reality has reached its potential in terms of application field yet.

- One of the most important features of augmented reality technology, which has significant potential for experiencing research and discovery experiences, is that it provides an environment that is ready for use anytime, anywhere.

- Due to the content creation features of augmented reality technologies, the created content can change users' perceptions of experience and space.

- Augmented reality applications can currently reach their users via smartphones and tablets. In the near future, new tools (such as leap motion, contact lenses) that will bring augmented reality into life will have more active use. From this point of view, companies that want to raise awareness and take part in the future of their target audiences will give more importance to these practices. Considering the developments in technology and the rate of its development, it will create developments that will revolutionize the human lifestyle.

- From social media filters to surgical procedures; the popularity of the concept of augmented reality is increasing rapidly.

- Elements of the virtual world can be transferred to the real world thanks to augmented reality technology. Thus, people

can experience the virtual world by seeing, hearing and feeling more.

- Compared to other reality technologies, augmented reality is in the middle of the mixed reality spectrum. Mixed reality promises much richer content and much richer interaction.

- It is a fact that technology will occupy more areas in human life. Augmented reality proves itself as a useful tool in this regard, and with the changing consumer perception and developing technology, much more useful usage areas will be created.

REFERENCES

1.Şahin, D. 2021. Markaların Endüstri 4.0. Bağlamında Gerçekleştirdikleri Uygulamaların Tüketiciler Üzerindeki Yansımaları - Practices Implemented by Brands in The Context of Industry 4.0 And Its Reflections On Consumers, PhD Thesis, Institute of Social Sciences, Istanbul University.

2.Yaratan, A.S. 2022. Mimarlık Eğitiminde Artırılmış Gerçeklik Uygulamalarının Öğrencilerin Akademik Başarı ve Tutumlarına Etkisi - The Effect of Augmented Reality Applications in Architectural Education on Students' Academic Achievement and Attitudes, Master's Thesis, Institute of Educational Science, Fırat University.

3. wikipedia.org, https://en.wikipedia.org/wiki/Augmented_reality, (Accessed: 19.02.2022).

4.medium.com, https://medium.com/@argoproject/a-brief-history-of-augmented-reality-infographic-af040a4fd86f, (Accessed :18.02.2022).

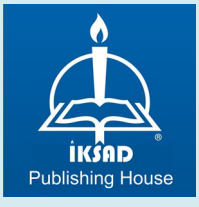
5.slideegg.com,.https://www.slideegg.com/image/webp/preview/catalog/88612Difference_Between_Virtual_Reality_And_Augmented_Reality_PPT.webp , (Accessed: 18.02.2022).

6.Meriç, H. 2021. Artificial Intelligence-Aided Product Design Practices, Iksad Publications. Ankara, Turkey.

7.autodesk.com, https://www.autodesk.com/solutions/generative design, (Accessed : 12.02.2022).

8.develop3d.com, https://develop3d.com/reviews/review-fusion-360-generative-design-autodesk-engineering, (Accessed: 16.02.2022).

9.Meriç, H. 2021. Generative Design for Bookshelf and Tv Unit Design, Iksad Publications. Ankara, Turkey.



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