



TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY

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MODERN WOOD SLAB TABLE

Master's thesis

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Technology of wood and plastic, KVEM 12/13

Tallinn 2015



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POLÜMEERMATERJALIDE INSTITUUT

PUIDUTÖÖTLEMISE ÕPPETOOL

MODERNNE MASSIIVPUIDUST LAUD

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Declaration

Hereby I declare that this master`s thesis, my original investigation and achievement, submitted for the master degree at Tallinn University of Technology has not been previously submitted for any degree or examination.

All the work of other authors, important aspects from literature and data from elsewhere use in this thesis are cited or (in case of unpublished works) authorship is shown in the text.

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MASTER'S THESIS ASSIGNMENT

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Master s thesis topic

” Modern wood slab table “

” Modernne massiivpuidust laud ”

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Aim and tasks of master's thesis: To examine and analyse the design and production of modern wood slab tables with new technologies, new materials and modern design. Development of the modern solid wood table 3D models and production of the prototype.

Abstract

Based on internet and social media technologies, furniture trends are changing very fast in the last few years. Just in a few years ago, when the internet and social media had not been using very effectively like today, the only way to see new furniture trends was visiting fairs or shops of branded goods. It was very difficult to promote their products for local and small woodworkers and furniture producers. However, in today's world with today's technology, a new product or design can be promoted in a few minutes around the world. In parallel with these developments, there is an uncontrolled modernization and trend change can be seen in the furniture industry. On the other hand, even people have been producing since early recognition, tables which made of wood slabs have not been effected this modernization aslike other furniture. Because of each tree species and wood slab has its own special texture, the difficulty in mass production of wood slab tables with similar looking occurs. During this research, the ways and possibilities for modernization of wood slab tables were under the study. The effects of contemporary design wood slab tables, new materials and material technologies, production technologies, ecological effects and market research on wood slab tables were discussed in this thesis. During the study, 4 concept designs prepared as 3D modeling as $\frac{1}{8}$ scale and final concept produced as a prototype of modern wood slab table.

Production process of wood slab table was worked out. The results of this research are important for developing modern wood slab table with custom design based on new technologies and new materials.

Keywords: Wood slab, wood slab table, furniture design, furniture production technologies.

Introduction

Wood slab tables have been created and used by people since early times. As a furniture, usage of wood slabs as a tabletop has limitation somehow. Production difficulties and material limitations are the main reasons for mass production problems of manufacturing wood slab tables. In parallel with the lack of mass production, wood slab table tops could not be improved with design and modernization. Market researches showed that, there are many tables with wood slab table top have nearly the same designs. Although there are extremely important design improvements and material technology improvements occur for table and other furniture types' manufacturing (e.g., plastic tables, plywood tables, metal tables, sofa, chair). There is a lack of improvement for wood slab tables compared with other furniture types.

The aim of this study is to analyse the design and production technologies of wood slab tables with proper wood species. To investigate new technologies and new materials that can be applied for modernization of the table design. By producing a concept of the table, it is planned to understand the difficulties of design and production phases. Beside the plan for production of the table prototype, interview with a professional woodworking company representative is planned to carry out. This could help to understand the tricks, difficulties, key points for wood slab table manufacturing, marketing and more.

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1. Market research and product analysis

Wood has been taken an important material for human since the earliest ages that they able to make and use tools, war equipments, farming tools, industrial needs, furniture and more. With the ability of forming and using the wood for their needs, wood as a material has started to take shape as tools. With experiencing and observing, wood as a material has been understood more. Later on, with the researches and analyzes usage of material improved and it is still improving day to day. (R.Youngs ,Forests and Forest Plants)

Furniture can be constructed by many types of material. Solid wood is the most common specie of wood and wood based materials however there are more forms of wood based products which are also frequently in use for furniture manufacturing like plywood, veneer, composite panels and engineered woods(Table 1).

Table 1. Major wood household furniture construction types used in 1989 based on sales (Meyer et al. 1992)

Construction material or type	Percentage of total
Solid hardwood	44.7
Non-wood laminate over composite material	25.9
Hardwood veneer over composite material	11.3
Solid softwood	8.4
Hardwood veneer over solid wood	5.5
Other construction types	4.2

By a long way, hardwoods are most common furniture construction materials. Properties of hardwood make it possible to use this species of woods more than softwoods. A survey and its results show that, there are 140 different species of wood are mostly in use for furniture manufacturing and only 16 softwood species are in these species. As a result of this survey it can be easily said that hardwoods are dominantly in use for furniture manufacturing (C. Webster. , 1984). In comparison with softwood species, hardwoods species mainly have higher density, much better furniture manufacturing characteristics, better quality of machining and finishing, higher strength and more attractive colours and textures. Such property differentiations make some of the wood species more popular and useful for furniture manufacturing. Hidden components of furniture such as frame, legs, cabinet backs etc. are mostly made of softwood species due to low costs of material.

Usage of solid wood for furniture has been the basic type of wood usage since earliest recognitions. The gap of furniture demand for human had been supplied by solid wood. Even the usage of veneer and plywood had been started in around BC 3000, it took long time to use veneer and plywood as a construction and furniture frame material. In early 1900s the industry of plywood and veneer started and its production still active and improving. (Youngs, 2009)

Solid wood as a table has been used since early recognitions. It was a need more than a choice. To place their items and foods people were producing tables. People have been using different tables in different cultures. Wood have been an easy to reach material for people and consequently people have been experiencing with the wood since very early times. Surprisingly, this material is still very popular and people still respect the colour, texture, smell and the emotions of the wood. Products which made

of solid wood are still popular and the demand for such furniture are very high. It has significant design value and for this reason, solid wood tables have an increasing artistic value. With the approaches of new technologies, new design ideas and production possibilities, new drying methods and technologies also with new materials, there is a modernization for furniture, which are made of solid wood, accruing.

Solid wood and wood slab tables are mass producible but mostly custom handmade furniture. Difficulties of mass production cause strange market situation for solid wood and wood slab tables. When it is compared, handmade and difficult to mass producible products are more expensive than mass producible products. On the other hand, large wood slab prices are more expensive than other wood based products (MDF, plywood, particleboard, OSB etc.). Even the investment costs of mass production facilities are high, wood slab tables are still more expensive because of material costs and accessing difficulties to large slabs.

After that, when the EU Furniture Market Situations and a Possible Furniture Products Initiative Final report is analyzed, it can be seen that wood furniture production value is dominant compared with other material based furniture (Table 2.). It must be mentioned that the wooden furniture aggregate includes wood based panel furniture and solid wood furniture (including wood slab furniture). With %20 share, soft furniture production follows. Some wood products are being used in furniture upholstery frames. Metal furniture holds %12 of the total shares and with other materials (natural fibres, plastic, glass or ceramic) used furniture to hold around %10 of total production.

Table 2. EU28 furniture production value, breakdown of products by main material used, 2010

	Production value
Wood furniture	57%
Metal furniture	12%
Soft furniture (upholstered, mattresses) (textiles, rubber, leather, etc.)	20%
Furniture in other materials (plastic, bamboo, rattan, cane, glass, etc.)	11%
Total	100%

(CSIL processing of Eurostat/PRODCOM data)

The furniture consumption of the world is reflecting how huge the market is. However, the market has segmentations. Regarding the prices of the furniture, some of the countries with high income spend more money for furniture and comparatively, countries with low income spends less.

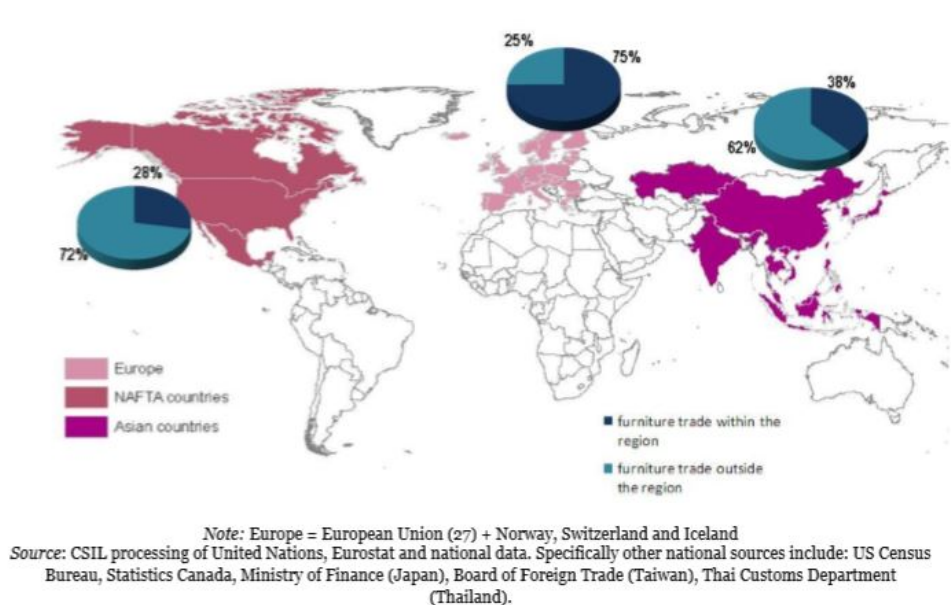


Figure 1. Percentage of international furniture trade carried out within each economic region

At this point, while clarifying the market position for a new product, choosing the correct market and countries is extremely important. Due to the fact that furniture trade from outside of the region in new and rich eastern market is very high, and also such countries have high personal incomes, for luxury furniture and middle range furniture these countries are preferable. Since wood slab tables are in high/medium price range, markets which have higher personal incomes can be considered appropriate. Beside all of these, wood is a renewable source, there will be always wood as a material. On the other hand, each wood has unique shape and texture. So it always attracts people. Since the designers and some small companies have started to make such a new furniture with solid wood, people recognize and like these new products. Especially people who like simple design, natural materials with minimum chemicals, innovative products would prefer these products. It is obvious that solid wood is more expensive than the other materials (MDF, chipboard, plywood, etc.). Such products may fill some gaps in the market. On the other hand, such furniture are being preferred as office furniture, restaurant furniture, hotel and meeting rooms.

1.1 Wood slab table tops and tables on the market

Wood Slab tables production has been continuing from very long times. Compared with other furniture products (such as wood panel products, chair, armchair, sofa, cabinets), wood slab tables has made very low headway. Simple construction of wood slab tables has wide similarities in each other. However, there a few companies have been producing wood slab tables with new designs and attractive legs. Such attempts are leading the modernization of wood slab furniture production. On the other hand, such furniture are not mass produced products. Making this kind of furniture requires craft and human force. There are many small companies producing products from wood slabs or solid wood. But these companies, mostly following old school trends in order to produce modern furniture.

Before it had been decided to create design ideas and produce a 1/8 scale prototype in methodology part of this case, current wood slab tables on the market had to be analyzed. This analysis is based on comparison of traditional wood slab table designs and new-up to date wood slab tables. Since there is a lack of corporate companies which are producing wood slab tables and producers are mainly local workplaces and companies, some of the products are selected from an online database and many of the product samples have been selected from Milano 2015 Salone del Mobile furniture fair.

In this case, comparison of traditional wood slab and solid wood tables with modern designs, new production technologies, new material appliances done. During this part of the study, differences between old and new can be seen distinguishedly. Four examples of traditional and four examples of modern wood slab table will be examined.

1.1.1. Traditional Wood Slab Tables

Many companies have been producing tables with nearly the same design and production methods. When the companies do not pay attention to producing new and more attractive products (see the Figure 2), they produce cheapest and easiest ones which can be easily seen many places, gardens, outdoor restaurants etc.



Figure 2. Traditional solid wood table

Currently, many indoor wood slab tables have simple and easy to make metal legs. These metal legs answer the purpose of carrying load very well. However, design value of such product is low. Once a design lost its uniqueness and grandioseness, that design goes to behind the time. This table example can be seen in many places (Figure 3). Due to the fact that its traditional outlook, such product will not have a place in modern furnished places. Additionally, some of the products on the market made of very qualified wood species and slabs, however bad finishing selections may affect the last appearance.



Figure 3. Common wood slab table with ordinary legs

Another very common usage of the wood slab table is using wood slab with living edges. This natural edge usage provides two untouched (no machinery, just peeling the bark) table edges. This production and design implementation are popular nowadays and its popularity is growing, but however, producers may still have some traditional engagements (see the Figure 4). During the production of live edge wood slab table, finishing (color), legs and cleaning of the edges must be done attentively.



Figure 4. Traditional wood slab table with old finishing

Since furniture trends change ultra fast, some of the furniture designs are unique. These immortal designs always find their customers on the market (C. Greenberg, Avant-Garde and Kitsch). Many traditional furniture does not include wood pieces which have cracks, surface deformations, insect holes or natural mistakes (see the Figure 5). In contrast with these traditional furniture, furniture producers using such deformations as an advantage and design element.



Figure 5. Fail wood slabs

1.1.2. Modern Wood Slab Tables

Even there is a lack of modernization for wood slab tables is being discussed, there are some companies and workplaces are producing wood slab tables which are very modern and unique. With the development of the social media, promoting a product is much easier. Local and small producers started to promote their products and big and corporate furniture companies are both promoting their products on the same channel. At this point, it can be easily said that a new product can reach and examined by a customer which is locating long away. On the other hand, a new design idea can be seen and produced by thousands of people just after the ideas owner shared the idea. In this information age, natural texture of wood needs some modernization to build modern tables.

New material technologies increased the quality of products. In parallel with wood slab table production affected by technological developments too. As it examined under 'technology and material parts of this study, many new innovations and modernity existing. Some new material implements, new designs, new production technology usages affected the wood slab tables. A few examples of innovative and modern wood slab table can be seen below.

During this study, while market research of the wood slab tables, Salone del Mobile 2015 had been visited. For Salone del Mobile is one of the biggest and most popular furniture fair in the world, it became excellent chance to see the fair. It was obvious that there is an increasing interest in wood slab tables and also for solid wood furniture. Riva1920 promoted showcased new two tables which are attention grabbing. Table they showcased made of very large wood slab tabletop. On the tabletop surface, gaps filled with transparent material (resin or epoxy) very professionally. The fashionable table leg was as elegant as a tabletop. (Figure 6)



Figure 6. Modern wood slab table (Salone del Mobile 2015)

Another new material implementation on the wood surface is filling the gaps with glowing powder and resin/epoxy mixture. Just after designer Mat Brown published his latest design, glowing shelves (Figure 7) in a few days many woodworker tried Mat Browns' idea. Wood cracks or holes (natural or human made) filled with resin-glowing powder mixture. When it is dark, furniture shines like a light source with this smart innovation.



Figure7. Mat Browns glowing shelf



Figure 8 Table implement of glowing powder with and without light

Instead of filling the wood cracks with transparent or colorful materials, another method which can be seen frequently is butterfly joint. To control wood cracks increase, woodworkers place butterfly joints or metal joints which also look good for the customers. Instead of not to use cracked or damaged wood slabs, the aim of using such

cracks and related to this using butterfly joint is to preserve the natural appearance of the tabletop.

Additionally to butterfly joints, some other joints which require craftsmanship and time consuming machinery, processes are also enriching the furniture. Especially dovetail, malloof and mortise-tenon joints are favoured traditional joint types for modern woodworkers.



Figure 9. Different joint implements (Contemporaryecowood 2014)

In addition to these, another key point of wood slab tables is table legs. Table made of two main part one is tabletop the other one is table legs. Thus the impact of table legs is as important as table top. Recently, molding technologies, CNC technologies, CAD CAM technologies, 3D printer technologies, prototyping conveniences have been developing. This development provides opportunity to design different table legs. (See the Figure 10)



Figure 10. Luxury tabletop and table legs (Anon)

1.1.3. Wood material used

Wood slab table tops can be made of with different wood species which will be examined in following parts. On the other hand, when products on market examined wood material usage as connections, design elements, construction(Frame) supporters.

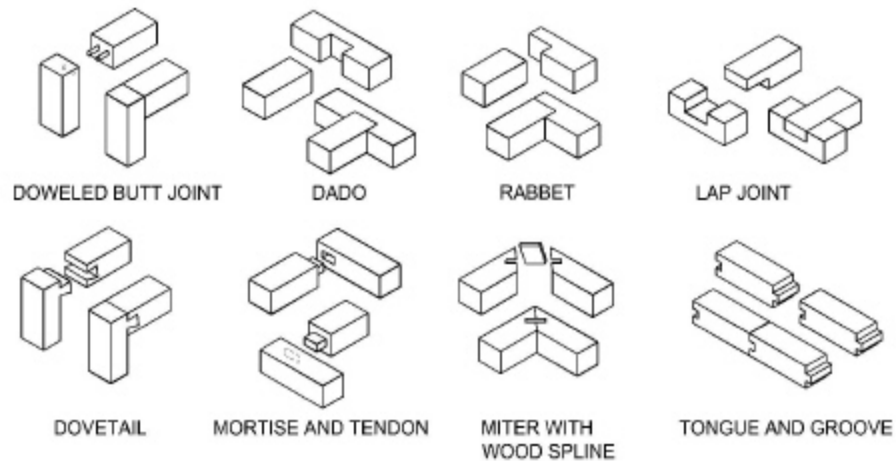


Figure 11. Wood joints (anon)

Popularity of using different wooden joints is increasing due to the fact that crafting such joints are reflecting the quality of workmanship as well.



Figure 12 and 13 joint samples

1.1.4. Other type of materials used

With different design implements, every single material has potential to be used as an additional material on table manufacturing. Since wood slab tables has two main parts which are tabletop and table legs, there are new also trend new materials available on the market.

Resin and Epoxy: As it is mentioned in Solid wood part, wood slabs may include some cracks and holes. Many epoxy and resin products have been being used for table manufacturers to fill the gap with. This is one of the very old methods. However, with new brands and new epoxy and resin production technologies, the quality of the products are much better and there are many varieties of color selection for epoxy and resin based products. This provides many different color implement on wood slabs' cracks



Figure 14. Gap filling of wood slab (Denim woodworks)

At this point, one of the innovations becomes a trend for filling the gaps with a genius idea. UK industrial designer and jeweler introduced his idea and product. He filled the wood cracks and holes with a mixture which is made of resin and glow-in-dark powder. While the environment dark, resin parts of the furniture glows(Figure 14). This little trick has become very popular just in a few weeks.

Connection Materials: In some situations, wood cracks requires filling or prevent keep going of the cracks. Woodworkers have created many solutions for such situations.

Butterfly jointers are the most known ones(J. Walker, 2010). There are new materials available to stop cracking which made of steel, molded steel (brand logo implements, figure implements etc.). These connection details are the most popular design implements on the market. Since natural wood is a very unique material and it has an endless trend value, minor attachments like crack stoppers add big visual changes to furniture.



Figure 15. Bow tie(butterfly) application

Light: It is a difficult and complex task to add lightening function to furniture. Because of the power need, combining the wood slab with lightening is not very popular. Even it is not very easy and preferred, there are some table designs with light can be seen at market. On the other hand, technology of lighting has been developing very fast. New LEDs are very cheap also requires very low energy. LED lights also can be merged with other materials which provides wide design implement opportunities.

Especially light and plastic material combinations are becoming very popular. Because of the light source alone disturbs the human eye when it is not covered, plastic being taken its place between the light source and human eye. Plastic is easy to form

material, thus, to use light as a design element, it is a useful combination to use light and plastic together with wood slab table tops and also with table legs. Lighting usage with wood slab tables had been examined as a concept idea at part 15.

Glass: Since glass cutting industry developed, custom cut glass is being used with wood slab table tops. Especially colored glass layers are being used together to create some visual illusions as it can be seen on Figure 16.



Figure 16. Glass with wood slab table

Beside all of these materials, there are materials which have been being used rarely. During the market research, some material example, have been attracting the attention which used on table legs and table tops. Even it is not very common to see many examples, there are products includes copper, textured metals, concrete (beton), some construction materials (structural irons, installation pipes), paper based products, hand paintings.

1.1.5. Table Legs

Even there are not specific survey or study to explore the most used materials for table legs, desk and field researches show that metal legs are the most preferred. A combination of metal legs and wood slab table top furniture are a dominant percentage of the current world furniture market. Besides metal table legs, solid wood, plastic, glass, marble, stone are other popular alternatives for table legs.

1.2. Market segment

1.2.1. Interview with companies from market

The interview is a very successful method to reach very useful information on a subject. The method of interviewing is based on asking well planned questions to to receive a strong answer from the people or a single person. To ensure the trustable results for an interview, there are two main facts must be considered. The main thing is selecting the correct person to make the interview. It is very clear that the person who have full knowledge of the subject is going to give more useful information with his/her answers. Another key point is the asking the correct questions. Having sufficient information about the person who will answer the interview questions helps in preparing the questions which will be asked. To get the necessary information, qualified questions must be asked. Once the person is selected and after the questions were ready to be asked, answers arrived and they analyzed. Thus, successful interview will be done with the expected, useful, fresh information which come from these questions and answers.

In this case, interviewing agreed as a practical and applicable method. Lack of academic information and source limitations necessitated to bridge the gap with methods like interviewing. Beside this, interviewing planned to provide clear and direct answers.

Cengiz Ozen is the wood supplier and wood slab and solid wood table producer from Turkey. During the literature searches, many up to date sources were referring him as due to the his market, products and company profile. The company(Akdeniz Orman Ürünleri, 2014) which is managed and owned by C.Ozen is timber wholesaler and also furniture producer. The reason he selected for interview in this case comes from his wood slab furniture products and his experiences on this topic. Material and design are two keywords which are absolutely engaged. In parallel with this material and design link, Cengiz Ozen and his company become a reliable information source with interviewing tool. More information can be found on the website of the company.

The result of the interviews, prominent points are, natural resource problems, production difficulties, lack of innovation, mechanical properties of wood and problems caused by this, marketing, social media marketing and finishing of table issues.

Since wood slab table tops are mostly made of with large slabs, there are need for old and large trees. At this point, the ecological issues and laws come forward so there are difficulties to find suitable materials. After material and resource problems, there is a lack of mass producible problem comes. As it is mentioned previous parts, interviews show that lack of mass producible for wood slab tables causes lack of profits and machinery/technology usage.

The other important topic comes up from the interview is investigating the market and promoting the products. Producers mention that, with usage of video, picture, advertising sharing platforms (social media tools and applications) changed the way of promoting. With the increase of these social media tools, each company or small producer can promote their companies under equal circumstances.

1.2.2. Target group

With innovations on solid wood and wood slab tables, new trends, technological improvements on material and production, the target group of solid wood and wood slab furniture includes a variety of customers. Related to its price, customer segment of such furniture is medium-high. When the demand for such furniture (middle-high/Luxury) is analyzed, worldwide furniture fairs and fair participants show that demand of luxury furniture mainly comes Asian countries (mostly Arab countries), Europe and US. However, there are local woodworkers which produce furniture in small scale (hobby woodworking) produce wood slab tables which reduces the costs very much.

1.2.3. Price Group

Solid wood and wood slab table tops can be produced with different wood species. Because of each wood species has different mechanical properties and many other variations (texture, color etc.). On the other hand, each wood specie grows in different places. For this reason, prices may change according to the place. In addition, larger slabs may be more expensive on the market because of rareness.

To estimate a price range for wood slab tables (6 people dinner table size), it should not be forgotten that such furniture includes two parts which is tabletop and legs so when expensive materials used for table legs it increases the total price of the furniture automatically. With the desk and field researches, price range for a wood slab table can be estimated between 1000 and 7000 Euro. Even price range is very wide, there are many tables which are located on the edges, have very high prices. (Price range estimation done by ebay.com, etsy.com online sales shop helps)

2. Design and modeling of wood slab table

2.1. Different Concepts

2.1.1. Design

Design is the process of the transformations the ideas to products and needs. There are some useful tools and study techniques to help design process. With effective use of these tools, ideas proceed to concepts and tangible products. (K. Reeves, 2015)

In this study, focus is producing table by using wood slab or slabs. However, the main focus is adding some contemporary design touches as design value. In the design phase of the study, idea creating, idea development, concept creating parts has been done properly.

2.1.2. Brainstorming

Brainstorming is one of the most popular process for developing creative solutions to problems. Brainstorming works by focusing on a main problem, and generate as many as possibility and ideas. Important thing during brainstorming is not to limit the ideas. It is always better to add ideas which are very far and unrealistic. At the end, this method helps to find totally new ideas.

To make a furniture and come up with new ideas, lots of brainstorming done. As a result, collected ideas evaluated by me and most logic ideas helped to create concepts (Figure 17).

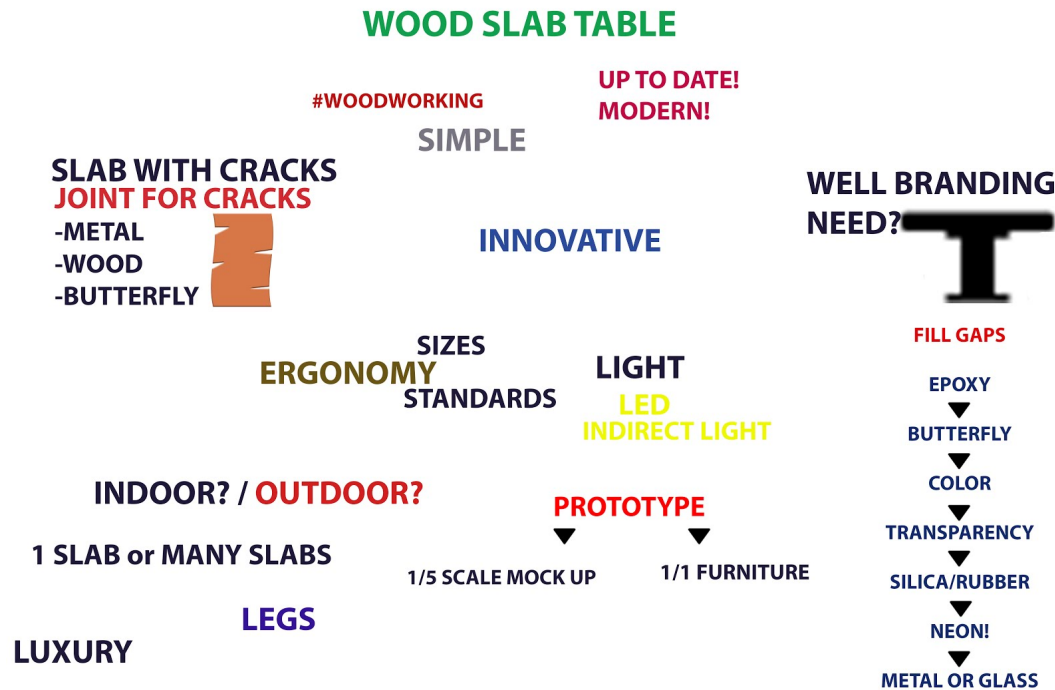


Figure 17. Brainstorming

2.1.3. Mindmap

Mind mapping refers to a technique that designers and engineers use to express and generate ideas. Mind mapping is a way to get all of the ideas in your head down onto paper. There is no right or wrong way to create a mind map. Simply, it is a visual representation of the thoughts in the designer's mind, and it often looks like organized chaos. Mind mapping, on the other hand, treats all ideas as equal, and a mind map gives easy access to an idea, and it allows to link it to other thoughts and ideas.

In this study, there are many options available. At the end of the mind mapping, it is possible to combine the ideas and produce different furniture concepts. Mind mapping is the very effective usage of criticizing the ideas and matching the different part of the furniture as a plan (Figure 18)

The reason that 'Mind Mapping' used in this phase is for creating concepts as a result of the study. At the end of the mindmap phase, concept ideas planned to be more clear and specific.

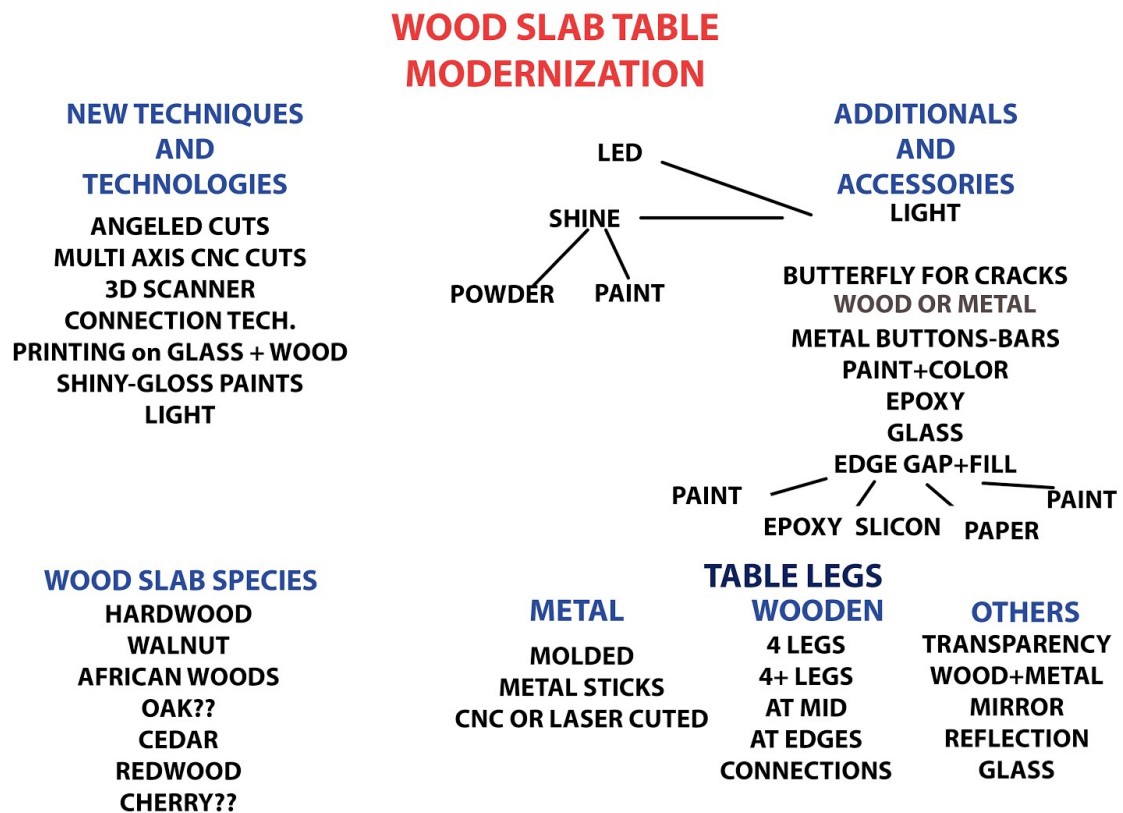


Figure 18. Mindmapping

2.1.4. Concepts

Tabletop Design Concepts 1

The wood slab includes natural ending at the sides. The main point of Concept 1 is creating blank at the sides of the slab. These new blanks provide new opportunities by

adding new materials and design ideas. This concept includes two different selections in itself. The first selection of this concept has gap at the side of the slab and these gaps have been filled with epoxy and plastic based materials (corian, plexiglass etc.). This design provide to use the side of the slab. Such designs may be very useful when connected with the brand, coopered identity and advertising approaches at the side of the furniture (Figure 19). Later on, the gap with sticker behind filled with opaque material (resin or epoxy). At the final, the paper product can be seen behind the filling material.

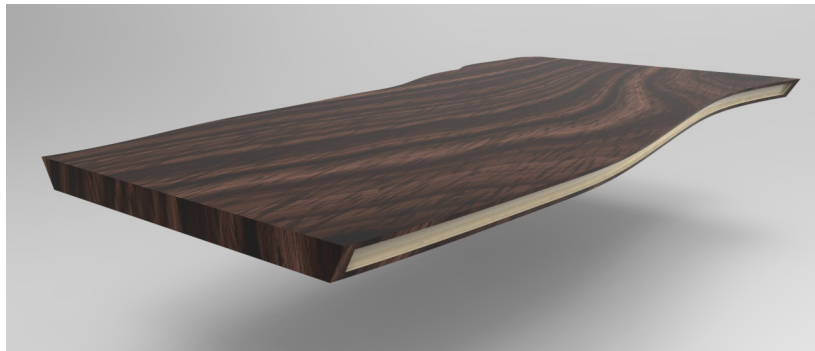


Figure 19. Concept 1

Second variation of Concept 1 is provides artificial light. The gap which locates at the sides of the tabletop is used as source of light. This light is not for brighten the place, it is for the visual quality of the place and the furniture.

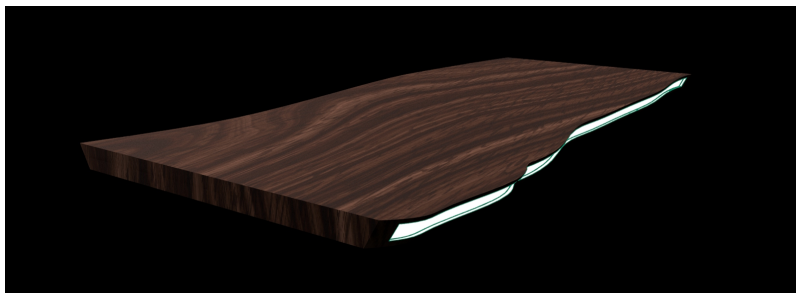


Figure 20. Concept 1 with light

Tabletop Design Concepts 2

Tabletop Concept 2 has formed by the angled cuts of the wood slabs sides. Angled cuts provides futuristic outlook to furniture. During the production, it may bring some difficulties and extra efforts. However, the stylish design of the furniture worths some extras (Figure 21).



Figure 21. Angled cut tabletop

On the other hand, when it is not possible to make the tabletop with one single slab, two slabs can be matched (bookmatch, slip match, herringbone match etc). During this concept designed, it has been tried to match two different solid wood slabs with unusual ways as a second variant (Figure 22).

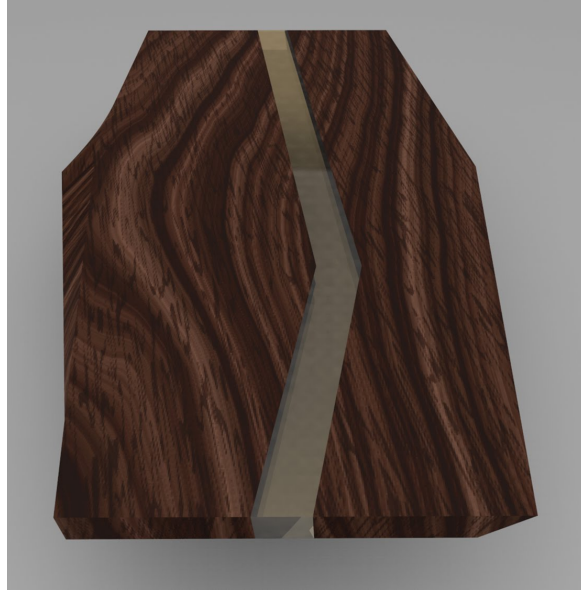


Figure 22. Angle cuts and epoxy together

Tabletop Design Concepts 3

Concept 3 is a simple wood slab with live edge which also provides small amount of light from the bottom of it. This light increases the significance of the room or place. How the light attached on the furniture is very basic. Attached light sources at the gap at the bottom edges of the wood slab reflects the light to the floor (Figure 23). This gives a mystery to people, because there is no visible light source at the furniture.

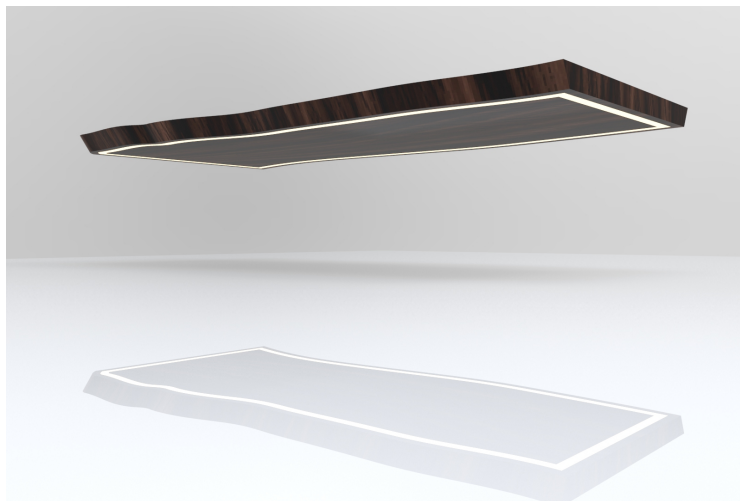


Figure 23. Wood slab with light at bottom

2.1.5. Result of design part

After many different design ideas were created, regarding to accessibility of production technologies and design trends, one concept has been chosen. Therefore, by taking into consideration of tabletop design, table legs have been designed. With some developments, table concept become ready for production (see the Figure 24). $\frac{1}{6}$ Prototype production started after all design, 2D and 3D technical drawings, renderings.



Figure 24. Final Concepts Rendering

2.2. Ergonomics

'Ergonomics' as a word comes from two different Greek words. 'Ergon' means work and the other word 'nomos' means 'laws'. However, Ergonomics is the world which is used to refer the science of designing the environment to fit the person, not forcing the person to fit the environment. Even as a word 'Ergonomic' is not familiar for all of the people, ergonomic products are very easy to realise for everyone. (StarCraft Custom Builders, Body Friendly Design)

During producing table, it is very important to follow human factors and ergonomics. Distance between tabletop and ground, distance between tabletops bottom and ground, tabletop thickness and planned place for a person are the main points which must be considered during design and production. At Figure 25. Ergonomics for table can be seen.

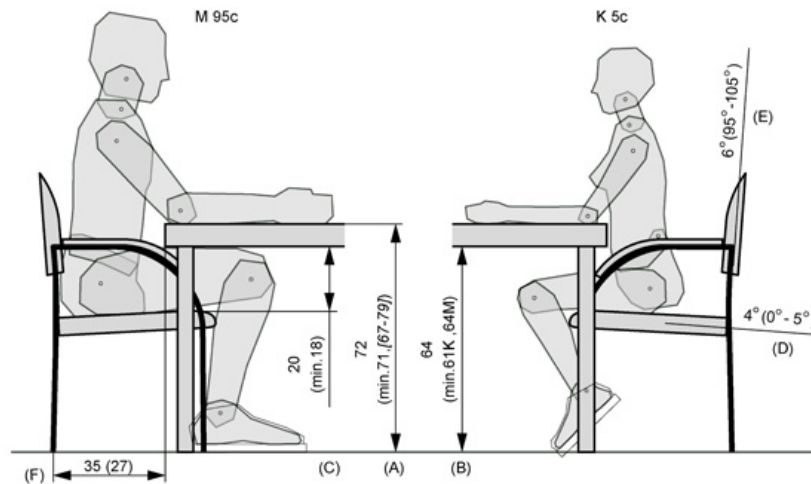


Figure 25. Table Ergonomics

While designing table which has more than 2-3 cm thickness, it must be considered the dimensions between the bottom part of the table top and the ground. Otherwise, when the tabletop is over thick, it can cause problems when cross-legged sitting position and sitting on one leg.

Since adjustable furniture are becoming prevalent, having an ergonomic furniture is much easier. The people can adjust the furniture heights and parts' angles which provide comfort for every user. However, some products, it is difficult to produce adjustable furniture, thus designers who design such furniture must pay sufficient attention to human ergonomics.

2.3. EDP (Environmental Product Declaration) Protocol of Prototype

Modernization for products on the market require some standardizations. To control some parameters of the products, there must be such standardizations. In other words, modernization brings some responsibilities and to control these responsibilities, standards are required. EDP is one of these.

2.3.1. Product information

Modern, elegant design of furniture combined with the solid wood slab and painted metal pieces appliance for the product. With the usage of unusual wood cutting techniques and traditions, the final product has powerful and attracting.

As Dieter Rams said, 'Less is more'. During the design phase of the product, designer focused on not to adding extra and useless functions to the furniture. This focus gave designer a chance

For thinking about product outlook design more which is also the modern point of the furniture. Angle cuts of tabletop and legs satisfy fully the customers' aesthetic expectations.

2.3.2. Product description

The table is an unique custom made product. It is available with a variety of sizes and colors regarding to customers want. Tabletop of the furniture is made of with wood slab. Table legs are made of with metal.

2.3.3. Material content

Product Material Content and Consumption changes depending on the dimensions of customer wants. As a first prototype and first product, material contents and consumptions can be seen on the figure 26.



Figure 26. Material Consumptions

Wood: Tabletop is made of wood slab and it is the dominant piece of the furniture. Consumption of the wood on the table is %77 (as a volume) and the weight of wood part is approximately 104 kg. However, this weight of wood part may change regarding to the wood species selection and the dimensions.

Metal: Some parts of tabletop sides, table legs, leg sides and some supportive pieces under table top are made of metal. Metal pieces are painted. Total volume of metal parts of furniture is %13 total furniture and the weight amount of the metal parts are approximately 22 kg.

Packaging: Packaging materials which are paper and plastic based materials to cover and protect the furniture during logistic. These materials are %8 of the total furniture. This percentage changes regarding to logistic differentiation and size of the furniture.

Other Materials: There are some other items used during the production. Screws, floor and furniture protectors, paints and glues are the main items. These items are approximately %2 of the furniture.

2.3.4. Life cycle assessment

LCA is an assessment of the environmental and human health impacts of a product over its entire lifecycle, from raw material extraction through manufacturing, use and end-of-life. Life Cycle Assessment (LCA) is created to evaluate the environmental performance of table.

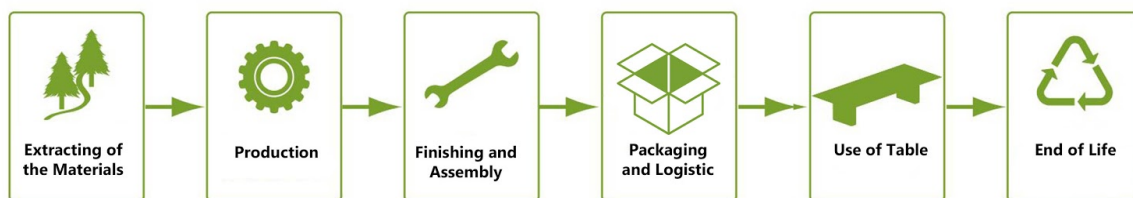


Figure 27. LCA

2.3.5. Extracting of the materials

The materials of the product are mainly, wood, metal, packaging materials, finishings and other connectors. The wood part of the table (Tabletop) is harvested wood which is dried and sliced with wood finishing (varnish). Metal parts of the table legs include recycled metal pieces.

Production

This phase includes forming the metal and wood and make them ready for assembly. During the forming wood, there are some extra pieces may show up. These extra pieces of wood can be used for other product production or small pieces join the production of MDF, Chipboards etc.

Metal parts are molded pieces so there are nearly no extra materials of metal.

Finishing and Assembly of Table

Finishing of the wood is done by handmade and custom varnish selected by customer. The connection of the wood and legs done by hand as well. After the assembly of the table, it is ready for packaging phase.

Packaging and Logistic

Packaging of the product is done by hand. The legs and tabletop are covered by plastic films and after, covered with cardboard to prevent any damage and cracks during logistic. On the other hand, it can be assembly at the final place(customers want) if it is not possible to bring the table as an assembled product. During logistic, product carried on pallets in the truck.

Use of Table

The table has a 20 year of envisaged use under normal conditions. However, since the product is massive wood and metal based product, if this use duration is more than 20 years, it will not be a surprise. If product cares and maintenances(re-varnishing, caring from heavy water, connection maintenances etc.) are done regularly, the use of product may be even endless.

End of Life

If the product fulfilled the product life and as a result of its end of life , the wooden parts of the table can be reused very easily and the metal parts of the furniture can be part of recycling chain easily.

2.3.6. Product life cycle

Starting with raw material to finishing with the end of the product use, the steps can be seen on the table. Because of different product concepts include light and also the design may be produced with different materials(mdf,chipboard etc.) alternative production steps are also added on the figure.

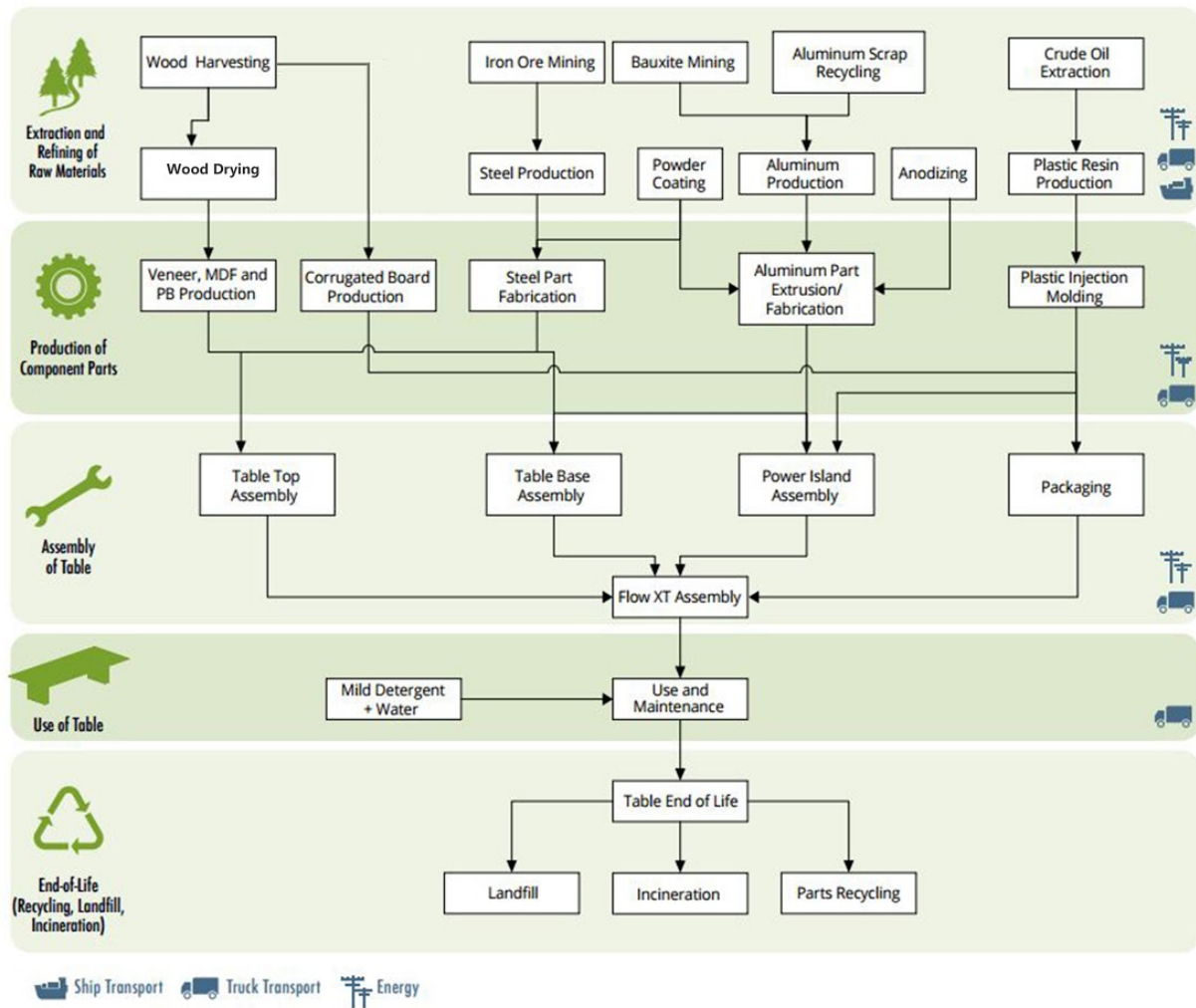


Figure 28. Detailed LCA of Product

2.4. Development of design concepts

Prototype production gave many opportunities about the design of the table and production. At the end of the design process many concepts eliminated and final concepts prototype production started. Prototyping is a very didactic way of learning so at the end of the prototyping final concept prototype produced. By comparison with final concepts technical drawings and final prototype, there are some differences which

caused by the difficulties of producing and small mistakes. In any case, during the development process quality of next prototype will increase.

On the other hand, eliminated design concepts are also part of modernization for solid wood and wood slab table study. These design concepts worth to be produced in next step of this study.

2.5. Terms of references for design

During the design phase, there are some parameters must be considered that guides the design. Market positioning, user age range, dimensions, materials, finishing options, packaging and promotion of the product are the main parameters which is described with table 3.

Table 3. Terms of references for design

Parameter	Description
Market positioning	Middle-upper class furniture segment.
Age range	Modern designed table is for house, restaurant and hotel use. Sharp edges may cause injuries so families with child may take care of them.
Dimensions	For 4 people : 1200mm x 750 mm For 6 people : 1500mm x 900 - 1050mm For 8 people : 2100mm x 900 - 1050 mm
Materials	For prototyping, walnut species used. It is possible to use another species as well. For legs, powder coating painted steel legs used.
Finishing	Finishing of table can be done with many methods and different oils, varnishes , water and natural oil based products. It is customer selection.
Packaging	The legs and tabletop are covered by plastic films and after, covered with cardboard to prevent any damage and cracks during logistic.
Promotion channels	Social media channels Online sales shops Local shops

3. Prototyping of the table

Prototyping part has a great importance for this study because the link between design and production is mostly very baffling. Prototyping is a very common production part. Importance of prototyping comes from the advantages prototyping brings. After design part it is mostly not correct to start producing directly. Design phase may contain mistakes or difficulties which can be easily seen during prototype production. Machineries, connections, standards and analyses, material quality and reproducibility can be understood during producing a prototype.

Acceptable design must be producible so since the main importance of the methodology part of this study is to 'design and produce' a modern wood slab table in $\frac{1}{8}$ scale, this prototype producing part matters to have a result at the end. Regarding to material costs, the possibility of making mistakes and the size of the product it had been decided to produce $\frac{1}{8}$ scale prototype.



Figure 29. Finished product design

3.1. Material selection

Just before the production, it had to procure the materials. A walnut slab which was harvested from north east part of Turkey has been bought. Raw wood logs may include fails and also percentage of making mistakes during the producing prototype is quite high, larger than necessary slab has been preferred to buy. (see the Figure 30)



Figure 30. Walnut Log

3.1.1. Black Walnut(*Juglans nigra*)

Furniture and wood slab table producers use many wood species, most of these species are hardwoods. Properties of hardwood species have many advantages. Black walnut is one of the most preferred wood species on the market. The reason of preferring black walnut wood slab for producing a table is listed:

- straight grained
- easy to work with tools
- stable in use
- has an attractive texture
- strong, hard, heavy and has good shock resistance
- has good finishing quality

Even mechanical properties of black walnut is very good, the grain pattern of black walnut is also very beautiful. For this reason, furniture makers do not prefer to paint the furniture which made of walnut. Another important factor is availability. Black walnut is available source that grows mainly in USA and some region of Europe and Asia as well. Many black walnut trees can be saved before people use them as firewood.(United States Department of Agriculture, 2010)



Figure 46. Black walnut (*Juglans nigra*)

3.2. Material processing and manufacturing tabletop

After that, walnut log cutted with tablesaw in dimensions which was 30 mm larger than the final product because of as a tolerance for making mistakes (450mm x 250mm x 30mm). Cuted walnut part flatten with planing machine. Thus the surface became straight and also sawmill marks removed. Therefore, the most difficult part of the production, which is applying the twisting shape of the edges, has started. With reference to table design, the two edges of the table have twists which starts with 15-degree angle and ends with -30-degree reverse angle. To procure this difficult

tabletop edges, table saws cutter angle has been set up to 15-degree angle and two edges cutted. After that, the same process repeated with -30-degree angle (see the Figure 31 and 32).



Figure. 31 and 32 Start of angled cuts

After extra parts removed, despite the difficulties of sanding walnut, the edges have been started to shape with a sanding by hand and vibration sander until the perfect angle edges were ready (see the Figure 33 and 34)



Figure 33. Vibration sanding and Hand Sanding



Figure 34. Finished tabletop prototype

3.3. Manufacturing of the legs

Right after tabletop was ready, producing metal table legs had started. Sheet metal parts cut and later it has been tried to attach to wood part. However, while attaching it has been realized that the sheet metal parts were not matching with the tabletop edges. Twisting form of the tabletop edges had not been let to metal sheets to fit exactly as it

had been planned. At this point, by accustoming the metal sheet with mallet and hammer, metal sheets had been adjusted with table corners and edges. As it can be seen in Figure 35, each table legs required special adjustment.



Figure 35. Metal sheets adjustment

As far as metal sheets could fit with edge and corners of the tabletop, each metal sheets have been welded. Welding marks has been removed and at the end of this process, each metal legs become ready for painting (Figure 36).



Figure 36. Preassembly of the legs before painting

Since metal table legs production has finished, they painted with matt black. Because of durability, large color scala, impact resistance and finished quality metal legs painted with polyester powder coating technique. Working principle of polyester powder coating technique includes oven drying for this reason it took a while to finish painting parts. At the end of the table legs painting step, metal legs can be seen in Figure 37.



Figure 37. Polyester powder coated painted metal table legs

3.4. Assembly

Just before table legs assembly, tabletop has been sanded again to have a smooth surface before finishing. For finishing, water based natural (matt) product has been used with a very thin layer and after it dried legs have been assembled (see the Figure 38 and 39).



Figure 38. Finished Prototype



Figure 39. Finished Prototype

4. Manufacturing technology of table

4.1. Wood harvesting

Since environmental and sustainability topics are the most important topics to be talked about nowadays, wood harvesting brings huge responsibilities to furniture industry. Even wood demand for furniture industry is not a dominant part of a total demand of wood, harvesting wood has some rules, standards and ethics. Sustainable Forest Management (SFM) emphasizes that the timber production is considered sustainable if the harvests are planned to not cut more wood than is grown. When the forest inventory of the world starts to decline, this causes multiple dangers. It is clearly mentioned with Carbon management project by Future Science group that 'Forests managed for sustainable multiple ecosystem values would attempt to include a sustainable balance between timber outputs, ecosystem values and economic or social values; acknowledging that not all forests can produce all values. Unmanaged forests may result in regeneration after natural disturbances, but are subject to mortality risks that complicate restoration. Unmanaged forests do not support sustainable timber production; however, they may contribute critical ecosystem values not found in timber producing forests. ' (Carbon Management 2012, Future Science Group). However, many woodworkers harvest wood in small scale. To have wood slabs for tabletop manufacturing, people do not harvest wood in such big scales like wood harvesting for energy production or construction materials. Because of using wood slabs as a tabletop is not a mass production business, woodworkers evolved their own solutions. Before harvesting a single tree for having multiple wood slabs to use as a tabletop there are some key points must be considered. Many professional woodworkers do not prefer to use a regular urban tree. Cutting an urban tree to produce something out of that tree is not recommended since there are many trees which are end of their lives or they are about to die available. On the other hand, many people cut trees to use as a firewood, which can be used for furniture (D. Boyt, 2014).

Before cutting a tree for any uses, there are different permissions which show difference regarding to the country and its laws. Permissions and certificates topic must be researched as another research topic.

4.2. Wood drying

Each living part of a tree has water in it. During the photosynthesis, water takes one of the most essential missions, which provides the growth of the new tree cells and growth of the tree. Usually, sapwood has more Moisture Content than heartwood. Generally, the water amount of a tree is more than half of the total weight amount in a tree. This water is also called by 'Moisture Content (MC)'. The moisture content calculation as a percentage is being done by the weight of water present in the wood divided by the dry wood substance weight. For example, a wood slab which is 45 kg in total weight contains 15 kg of water and 30 kg of dry wood substance have a %50 moisture content (MC). The weight amount of a water can be more than weight of dry wood content. (D. Bousquet, 2000)

The water inside of the wood, which is improper for wood usages, needs to be exported from the wood and this process is wood drying process. During the process, wood and the air (which wood locates in it) exchanges the moisture until the Equilibrium Moisture Content (EMC). Moisture content of wood differs regarding to the usage purpose. The percentage of proper Moisture Content for wood post (outside usage for electricity) %25, for building carcasses and outdoor usages %16-22, for barrels %17-20, for transportation and ship's decks %15-16, for sport equipments, outdoor hand tools, outdoor (garden) furniture %12-16, for outdoor windows and doors %12-15, for indoor furniture %6-12, for flooring %6-8. (M.Ozalp, M.Ordu, 2010)

Moisture content change causes some physical deformations on wood slabs which is why wood must be dried before it has been used for planned purpose. During the drying of wood process, it is important to control form changes. Variations of temperature and moisture conditions directly affect the deformation process. To minimize the unwanted deformations, such as cupping, twisting, crooking and bowing (Figure 40), environmental conditions can be optimized during the drying. (O. Dahlblom, S. Ormarsson, H. Petersson; 1996)

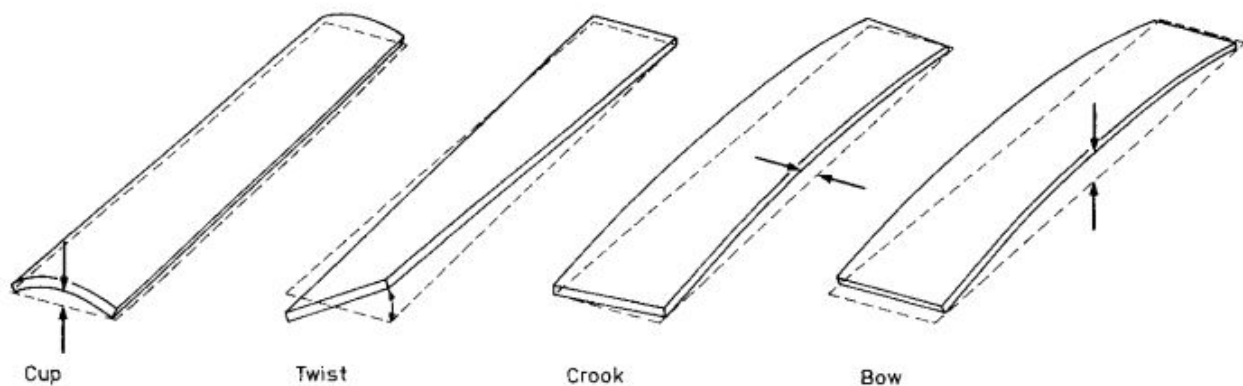


Figure 40. Wood deformation types(Anon)

Drying the wood increases the price of wood. Beside this, drying wood provides some technical opportunities.

- Dry wood has less weight. It reduces shipping and handling costs.

- The shrinkage which accompanies drying takes place before the wood is used as a product or material. Dry wood has little or no possibility of developing new cracks, checks, or splits.

- While wood drying, most of the strength properties increase.

-The strength of joints, nails and screws are much stronger in dry wood than green wood.

-Before it can be glued or treated with preservatives and fire and blaze retardant chemicals, wood must be relatively dry.

-Drying wood increases the mold, stain and decay properties of wood.

-Drying wood increases thermal insulating and finishing quality properties.

There are several methods can be used for wood drying. Basically, air drying and kiln drying are two main concepts of wood drying process. Beside these two main concepts, each has different applying methods. Simply, all methods involve moving moisture from the wood to the surface, where it is evaporated into the air. (USDA Forest Service Forest Products Laboratory , 1999)

Table 4. Sustainability of system for various species and lumber thicknesses

Drying system	Hard-to-dry species		Moderately hard-to-dry species		Easy-to-dry species	
	4/4	8/4	4/4	8/4	4/4	8/4
Air dry and kiln dry	Fair–Poor	Poor	OK	Poor	OK	OK
Shed dry and kiln dry	Excel.	Excel.	Very good	Good	Good	Good
Fan shed dry and kiln dry	Good	Fair	Excel.	Excel.	Excel.	Excel.
Predry and kiln dry	Excel.	Fair	OK	Fair	Poor	Poor
Kiln dry	Excel.	Excel.	Excel.	Excel.	Excel.	Excel.

(Anon)

4.2.1. Air drying (Open Yard)

Air drying is drying the wood by using natural sources, wind and sun. Stacked wood slabs by using stickers between each slab start drying with the prevailing winds to blow

through the pile (see the Figure 41). Weather is one of the most important factor which changes the duration of drying. If slabs dry too fast it may cause cracks and deformations on slabs, on the other hand, if the slabs dry very slow it will not be very profitable. In addition, for lumber that is to be used in furniture or some other finished product which requires a 6 - 8% moisture content, air drying alone is not enough. Such a situations air drying is often used as a first step (NYLE, 2012)



Figure 41. Air drying wood slabs (T. Donsker)

4.2.2. Shed Drying

The difference between open yard air drying and shed air drying is to protect wood slabs from the direct sunlight, rain and snow they can be placed under a roof. Drying times are very close with open yard air drying.



Figure 42. Shed Air Drying of lumbers

4.2.3. Forced Air Drying

Stickered packages of slabs are placed in closed buildings that have fans to circulate heated air through the slab stocks. Some wood species can be dried faster thus, addition of fans increase the efficiency of drying process and quality of drying. (United States Department of Agriculture, 2000)

4.2.4. Kiln Drying

The process of kiln drying consists basically of introducing heat. This may be directly, using natural gas and/or electricity or indirectly, through steam-heated heat exchangers, solar energy. In the process, deliberate control of temperature, relative humidity and air circulation is provided to give conditions at various stages (moisture contents or times) of drying the timber to achieve effective drying. For this purpose, the timber is stacked in chambers, called wood drying kilns, which are fitted with equipment for manipulation

and control of the temperature and the relative humidity of the drying air and its circulation rate through the timber stacks.

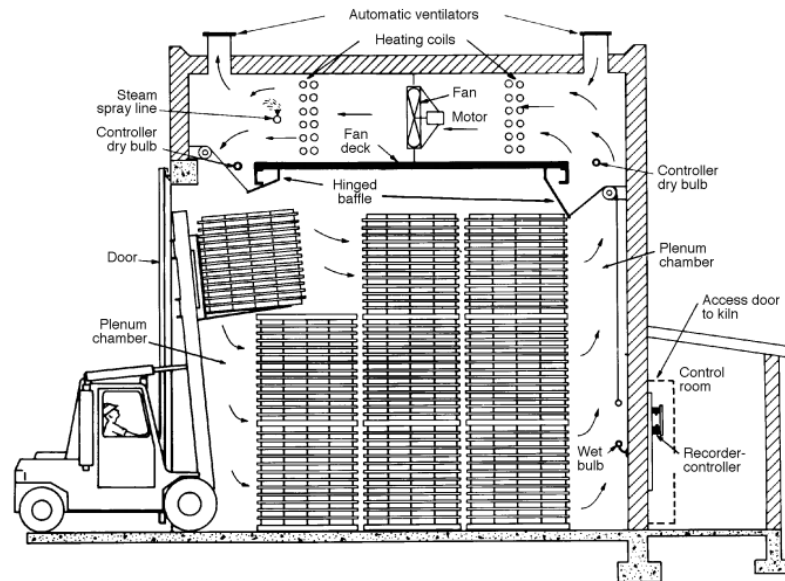


Figure 43. Kiln Drying Principles

Drying wood slabs with conventional and classical drying methods are longer and expensive. It is caused by the low permeability of solid wood. Drying in high temperature conditions can reduce the drying time however color change, deformation and cracking drying risks are still exist. In addition to these drying methods to reduce drying time of solid wood, using radio frequencies while drying process (dielectric method) is more proper. Dielectric wood drying provide to dry wood from inside to outside which minimizes deformation and cracking wood during drying. By using pressure (vacuum) and heating combinations, while drying duration and energy consumption can be reduced, the quality of the wood increases.(R.B. KEEY; T.A.G.LANGRISH; J.C.F.WALKER, Kiln drying of lumber 1999) Even dielectric method alone is an efficient way to dry wood, by combination of dielectric and vacuum is also a great opportunity to dry wood. Vacuum enables to use lower temperature correspondingly evaporation temperature is lower which helps to preserve wood properties and prevent cracking.

On the other hand, to provide air circulation classical drying methods needs to place sticks between lumbers during stacking the lumbers. But dielectric drying does not require to place air circulation sticks between lumbers. This provide to apply pressure and force to control and reduce deformations like cupping, twisting, crooking and bowing. (Ö.Unsal; C.Guler 2012)



Figure 44 Dielectric and vacuum drying

4.3. Technology

Wood slab table production tools are basic furniture maker equipments. During technology part of this study, the equipments have been examined with production order.

Sawmill: Sawmill is the main machinery to slice the rough wood before drying. With the sawmill, an operator cuts the lumbers into the slabs. These slabs will be dried and dried woods will be used in furniture manufacturing. There are portable sawmills available on the market, which may be more useful for slicing the wood at different places.

Band Saw: While working with wood material and manufacturer want straight or different cuts on the slabs, band saws become very helpful. Because of the usage, band saws helps to work with many angles, curves and flexibility. During wood slab table producing process, due to the design differentiations, bandsaw helps to have curvilinear cuts. To have curvilinear cuts, woodworkers may work by hand or pattern.

Jointer: Even the slabs had been cut by sawmill before they have dried, slabs may not have a flat surfaces. At this point, to have a flat surfaces, jointers are very helpful machineries. During drying, wood slabs may have small deformations of their shapes. Jointer provides efficient workability for such situations.

Thickness Planer: While the wood slabs are not flat and durable, using thickness planer provides lots of time save. The principle of the machine is, rubbing extra wood parts until it become flat. Wood slabs which will be used as a tabletop needs to be flat so, thickness planer is suggested machinery for table manufacturers.

Sliding Table Saw: Sliding table saw is the main machine for a woodworker. To cut wood and wood slabs with planned sizes, cutting boards with planned thicknesses and opening gaps on wood surfaces table saws are extremely important machines.

In addition these machineries, there are hand tools, sands are being used for details of the production.

With the new technological increases, human force need on furniture manufacturing is being decreased. The quality of the final product has been increasing with new machinery technologies. By using multi axes CNC machines, very difficult works become easy. Production times are also decreased. Mistake percentages and tolerances are very low. Additionally, 3D scattering machines and CNC machinery

linked productions seems that they will be the tomorrow's high technology at production point. On the other hand, sharply increasing 3D printing technologies will found their places in furniture manufacturing process.



Figure 45. 3D printed table connections (Minale-Maeda,2014)

4.3.1. Welding Technology

During prototype table leg production, construction steel sheets(EN S232) welded by inert gas shield arc welding. The advantages of using this steel sheets are;

- good weldability
- construction steel so can carry heavy table tops
- Can be painted easily
- Fast and easy implementing
- Good impact resistance

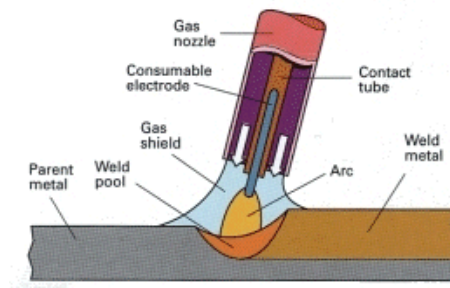


Figure 47. Welding principle

Conclusion

Wood slab tables are very popular in the market and this popularity is increasing. Solid woods texture, grains, natural feelings have a passion and attraction on people and in parallel with this impressions when it is linked with modern design, modern wood slab tables value is being found out.

After completing market research for this study, it was obvious that wood slab table market is developing very fast. By using social media, companies are promoting their products very easy and people can compare many products by just using their electronic devices (pc, tablet, smartphone etc.). This brings tough competition for producers surely. Thus, companies which produce up to date and modern furniture located a few step ahead than companies which are producing traditional furniture. Besides that, improving technological developments on material and production field is giving an opportunity to produce improved, innovative and modern furniture.

The target group researches were analyzed and it was concluded that because of the lack of mass productivity and wood slab tabletop high price the target customer group consist of middle and upper class people. However with benefits of new trends, people able to produce their own tables. Proper internet and information sharing technologies enable to share production tricks so people can learn to produce own simple wood slab table easily.

Design phase of the study included many steps to get final concept of design of wood slab table. Starting with brainstorming and mindmapping for design idea generation. Four Design concepts were worked out and designed as 3D models. Final concept was planned to produce as prototype and so material selection was made for prototype production. With the Selected American walnut (*Juglans nigra*) specie production part continued.

Prototyping part is very important in this study. To make comments about modernization of wood slab tables, it was necessary to produce a table even it is a prototype. After the prototype is produced, it became possible to talk about the subject and also results can be used guidelines of the topic.

While selecting the table top material (wood slab), it must be considered that the raw wood slab includes many defected parts inside of it. These decayed parts of the wood would be trouble while using the wood slab tabletop in one piece. Especially, wood slabs which will be used with living edges must be chosen very carefully.

During prototype production, machinery part and forming (sanding) parts took a lot of time and effort. When final prototype is compared with the 3D models technical drawings and dimensions, it can be seen that there are differences in size and twisting angles. Because of this angle and size differences, metal sheets assembly required accustom adjustments by mallet and hammer. However, tabletop had been being designed with straight parts which matches with metal sheets. During the sanding, these parts lost their straightness so while adjusting metal sheets with the wood slab, it needed an extra force to match them exactly, without gaps between both metal sheet and wood slab. At this point, it can be said that it would be more successful if CNC had been being used for cutting and shaping the twisted edges. Production of futuristic designed product may require cuts with less tolerance in particular with the edges which will connect with another material (wood-metal, wood-plastic, wood-glass etc). On the other hand, time saving by using CNC machines is irrefutable.

Tabletop finishing is done properly however finishing vary from person to person. There are many different finishing products available (water based, oil based, natural - matt varnishes etc.) and they all have different looks. So finishing become a questionmark during the production.

Table legs were done by local blacksmiths helps. It took long time to adjust each table legs and weld them together. When the table is producing 1/1 scale it can be optimized and produced from single metal sheet by bending from correct places which will provide perfection for furniture.

At the end of the study beside market research, target group analyses, material researches, technology and design parts, $\frac{1}{8}$ wood slab table prototype produced. When the table prototype and expected 3D design compared, the final product is very satisfying. Even there are some unexpected dimension problems, final model matches well with the prototype. However, to avoid the dimension problems, technology (CNC, 3D printer) is recommended.

At modernization point, design, material and technology are the main keywords. Design of the prototype was futuristic. In this case used materials for prototype manufacturing were not new and innovative materials. It can be concluded that using new and innovative materials (see the **part 1.1.4. Other type of materials used**) obviously helps on modern outlook of the furniture. The last important point was technology. Proper using new technological machinery for wood slab processing certainly enable to produce difficult and complex shapes in less time with less effort.

Resümee

Viimastel aastatel toimunud tehnoloogia kiire arengu tõttu on mööblitrendide muutmist võimalik jälgida sotsiaalmeedia ja interneti vahendusel. Veel mõned aastad tagasi kui sotsiaalmeedia ei olnud nii tihedas kasutuses kui praegu, olid mööblitrendide näitajateks disainimessid ja brändide esinduskauplused. Mööbli ja puitesemete väiketootjatel oli keeruline oma tooteid turundada. Kaasaegses infoühiskonnas, aga on võimalik toodet ja tootedisaini turundada mõne minuti jooksul üle maailmsele turule. Paralleelselt eelpool mainitud arengutega toimub mööblitööstuses moderniseerimine ja trendide muutumisenii kiiresti, et seda on raske jälgida. Teisest küljest on traditsioonilist mööblit nagu näiteks massiivpuidust lauaplaadiga söögilauda disainilt vähe moderniseeritud. Igal kasutatud puiduliigil on oma tekstuur, värvus ja läige, mis muudab täispuidust söögilaua seeriatootmise keerukaks. Käesolevas magistritöös uuritakse võimalusi klassikalise täispuidust lauaplaadiga söögilaua disaini moderniseerimiseks. Kaasaegne disain, kus looduslike materjalide puhul näiteks kasutatakse puidust servamata prusstooriku väliskuju disainielemendina. Selles töös on teemadena käsitletud: sihtgrupi turu-uuringut, tootedisaini ökoloogilist mõju, uusi materjale ja mööbli tootmistehnoloogiaid. Tootearendusprotsessi käigus on välja töötatud neli tootekontseptsiooni ja kujutatud 3D mudelitena. Ühe disainilahenduse põhjal valmistati 1:5 skaalas tooteprototüüp, et saada parem ettekujutus tootearendusega seotud tehnoloogilistest probleemidest. Magistritöö raames töötati välja tehnoloogiline lahendus massiivpuidust laua tootmiseks. Magistritöö tulemusena välja töötatud modernse massiivpuidust laua disainilahendust ja tehnoloogiat saab kasutada eritellimusena valmistatavate disainmööbli tootmiseks, kasutades selleks erinevaid materjale ja uusi tehnoloogiaid.

Võtmesõnad: massiivpuit, täispuidust lauaplaadiga laud, disain, mööbli tootmistehnoloogia

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Appendices
Appendix 1

