Spring 5-3-2018

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MODULATING THE CRAFT

This Thesis Proposal is Presented to the
Faculty of the Department of Architecture
School of Architecture and Construction Management

by
Lee Dwight Martin

In partial fulfillment of the requirements for the Degree:
Bachelor of Architecture

Kennesaw State University
Marietta, Ga

Spring 2018
Modulating the Craft:

Technology has brought a new paradigm to the art of making. Digital technologies that utilize optimized production tools have transformed the traditional paradigm of the design-build construct. As new technologies have developed, most makers have disregarded the tools and skills of the past. Neglecting traditional craft has given rise to the term “fabrication.” Fabrication is a method of constructing which can be described as the absence of soul and character, in other words, one that is disposable in a contemporary culture.

This thesis problematizes a design process between the Craftsman of pre-twenty-first century tool making, and those of a post-twenty-first century Algorithmic act of making. The research and interrogation modulate Craft by using traditional hand and digital design tools, techniques, and processes for making varying scales of small, medium and large construction and building elements, using them in his or her own studio through the use of new digital technologies.
Technology has brought a new paradigm to the act, art and Craft of Making. Digital technologies that utilize optimized production tools have transformed the traditional paradigm of the design-build construct. As new technologies have developed, most makers disregard the tools and skills of the past. Neglecting traditional craft has given rise to the term “fabrication.” Fabrication is a method of constructing which can be described as the absence of soul and character; in other words, one that is disposable in a contemporary culture.

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The act of making is not altogether one that is easily defined. The first term that comes to mind when thinking of the act making is craft. Craft is a term usually used to define a degree of precision. However, precision is a mere resultant of crafting. To craft means to make a selection in terms of three variables those being the tool, the material, and the joint.

The discussion of craft and how we make is that primarily rose out of the rapid growth of technology during the industrial revolution. Before the revolution craft had been somewhat consistent that craftworker worked in guilds and were trained apprentices. The apprentices would learn traditional methods that had been passed down for generations. Before industrialization the tool and the material had been somewhat constant for more than a century. The Growth of technology during the industrial revolution challenged traditional craft. The tools of crafting had changed. The machine had replaced the traditional set of hand tools. Machines were fast paced allowing pieces to be produced much faster than ever before. The training of an operator was much shorter than that of a traditional craftsman.

This change in the discourse of making is attributed to a loss in traditional crafts. The works of the Arts and Crafts movement sought to repair this loss by altering design to a more simplistic, functional, yet beautiful value. The movement sought to produce quality well-crafted objects for all people. However, the movement was a failure. The wages of craftsman and the time involved in quality production of handicrafts left them only working for the wealthy of society. With that being said, the movement never veered from quality products and stayed true to the traditional crafts.

The notion of providing functional, quality made products continued even into the Modernist movement of the early and mid-20th century. The difference in this movement was that the designers of this time embraced the machine. For the first time designers where taking full advantage of the machine had to offer. Like the Arts and Crafts movement, Modernists saw a change in the tools of crafting but also a change in materials. Materials such as steel had been brought about new techniques and processes in crafting. The tools and techniques used by designers of the time were able to deliver designer and the material fast paced allowing pieces to be produced much faster than ever before. The training of an operator was much shorter than that of a traditional craftsman.

Today's technology brings a whole new paradigm to the act of making and the craftsman. The tool being another key component of the craftsman's selection is dependent on the inconsistent material. A series of investigations should be performed in order to make the correct selection of tool, material or product, and joinery combination.

We can define craft as the selection of the tool, the material, and the joint combination. These values are dependent upon one another in their selection. This research seeks to provide the answers to which tools, material, and joinery combination should be used to craft in today's society. The answers to these questions will lead the way to the process upon which the craftsman of today's time should operate.

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This thesis proposes a design process that integrates the traditional with the now. The material chosen for investigation is wood. The material is readily available, sustainable, and easily workable. However, wood is an inconsistent material. We must understand the properties of the material in order to properly craft. Technology has produced a number of products using wood material that tends to stabilize wood's inconsistency. With this understanding the designer can make a selection in terms of three variables those being the tool, the material, and the joint.

The tool being another key component of the craftsman's selection is dependent on the stage of the project. Hand tools allow the designer more control and seem to be more suitable for preliminary work in design stages. Digital machine tools are geared at producing very precise multiples. The production of multiples is important when discussing a modular building typology. The craftsman of today's time must understand both hand and machine acts of making in order to be successful in the act of crafting.

This thesis proposes a design process that integrates the traditional with the now. Building off of traditional wood joinery techniques the research seeks to provide a modular system of techniques and processes that work well in combination. During this process the designer will become a craftsman and able to work the wood using machine tools and a knowledge of traditional wood joinery techniques.
The Building DesignShop seeks to integrate the notion of design with the art of making. This connection is possible through exploration of craft. Craft being the method in which we make connections between materials. The craftsmen has been replaced by the computer in the building DesignShop. The designer works alongside the craftsman in the shop to learn the skills of the craftsman while the craftsman learns from the designer. The designer and the craftsman will learn craft in order to better understand the methods of craft. This collaboration allows for a process that is constantly aware of what it means to make and construct, similar to that of the ancient Master Builders. What does it mean to make and how do we go about it? Let's first discuss what is needed in order to construct. The first element of making involves the tool. The hand of the craftsman and the tool work together to make the object. The tool must be very skillfully handled, the length of the training depends on the complexity of the task but the craftsman must be able to control the material. The second element of making involves the process. The tools the craftsman has chosen to use in the act of making. The tool chosen should always involve the hand of the craftsman, the tool chosen should always involve the hand of the craftsman and is thought of as a variable upon which can be chosen by the craftsman, or may be given to the craftsman and is variable upon which can be chosen by the craftsman. The third element of making involves the material. The material is what the craftsman has chosen to use in the act of making. The material must be chosen not by the designer, not by the machine, but by the craftsman. The material is the third component of making. This collaboration allows for a process that is constantly aware of what it means to make and construct, similar to that of the ancient Master Builders.

What should a tool be and how should it be used? As previously discussed the material is nonexistent when using the computer as a tool. This process is all about speed and not quality. We do not embrace the process of crafting anymore, it is now the process of producing. As technology advances we have grown further away from the process and more toward the end result. We do not embrace the processes of design anymore, it is now the process of producing. We must recognize the failures of the Arts and Crafts movement. The tools of the digital age and the problems associated. The tool of choosing the digital age is the computer. This tool completely removes the notion of the hand in the work. The computer does not in any way engage with the material. The connection of the tool, hand, and the material are completely lost. In fact, material is nonexistent when using the computer as a tool. This is in contrast to the ancient Master Builders. In contrast to the digital age the end result and the process and outcome of the work will vary depending on the tool and the material. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our digital design tools are a tool for designing and technology in order to save the craft. As technology advances we have grown further away from the process and more toward the end result. We do not embrace the processes of design anymore, it is now the process of producing. As technology advances we have grown further away from the process and more toward the end result. We do not embrace the processes of design anymore, it is now the process of producing. We must recognize the failures of the Arts and Crafts movement. The tool of choosing the digital age is the computer. This tool completely removes the notion of the hand in the work. The computer has replaced the craftsman, it controls the tools. The craftsman is nonexistent in the digital age instead he has been replaced with the programmer. The programmer is the one who chooses the tool. The programmer is the one who chooses the tool and the tool is nonexistent in the digital age and the problems associated. The tool of choosing in the digital age is the computer. This tool completely removes the notion of the hand in the work. The computer does not in any way engage with the material. The connection of the tool, hand, and the material are completely lost. In fact, material is nonexistent when using the computer as a tool. This is in contrast to the ancient Master Builders.

The process by which a designer produces his or her work is what can be labeled as the act of making. This process has the potential to produce work that is all of art media. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design. As designers our work is not a painting. A painter does not paint by painting, but rather by constructs that painting. A painter thinks in terms of construct. A designer thinks in terms of design.
Few architecture firms in today’s time dare to reject the use of fast-paced computing technology. It seems we have come to a point in the design thought where we are focused on the programming and have completely forgotten about the human element. We often wonder why many of today’s most design leaders today is to produce the most complex computer programs, an exercise in the field of ‘computational architecture’. However, there are cases where this technology is used in the form of digital tools. I mention this in this way that if a studio should be judged on their intent and craft rather than their technology.

The studio of Tod and Billie believe, as are the remaining firms that are focused on the art of craft, that a studio believes strongly on the idea of the studio running effectively. This is true for the design process but also for the studio running effectively. Tod and Billie refer to the firm not as an office, but a family. One of the most intriguing parts of the firm’s “Slowness” process is the relationship between the designer and craftsman. Its an interesting thought, could the sketchbook become obsolete? The sketches help communicate the thoughts of the designer and even the conversations with the craftsmen. Is it worth the time to keep them? With almost total dependence on the computer in the profession there are few companies that are focused on the art of craft. Tod and Billie believe strongly on the necessity of the hand through their built work as well as their prominent design process. There are at least six tools that are available in the market place. However, this is a temporary solution and the future of the availability of these tools is uncertain. The type of building program is crucial in order to keep the firm running efficiently. This is true for the design process but also financially. The firm chooses to work primarily on public works or high-profile projects. They have generated enough opportunities to take on a commercial project because the center of the design process would shift from a product to all about finances. Most of the work is focused on a commercial project because the center of the design process would shift from a product to all about finances. This type of building program is crucial in order to keep the firm running efficiently. This is true for the design process but also financially. The firm chooses to work primarily on public works or high-profile projects. They have generated enough opportunities to take on a commercial project because the center of the design process would shift from a product to all about finances. However, we must not let technology control us as designers, we must instead control the technology as Tod and Billie have done.

As a general statement, Tod and Billie believe strongly on the idea of the studio running effectively. This is true for the design process but also financially. The firm chooses to work primarily on public works or high-profile projects. They have generated enough opportunities to take on a commercial project because the center of the design process would shift from a product to all about finances. This type of building program is crucial in order to keep the firm running efficiently. This is true for the design process but also financially. The firm chooses to work primarily on public works or high-profile projects. They have generated enough opportunities to take on a commercial project because the center of the design process would shift from a product to all about finances. However, we must not let technology control us as designers, we must instead control the technology as Tod and Billie have done.

For now the evolution of the craft and industrial design studio is inevitable. Science and principle in the field of architecture is becoming more important than ever. The firm’s process is not finalized until after the foundations are being poured. The design process continues into the construction phase which allows for changes according to the project’s needs. The firm encourages these changes in the field because they want to hear what the craftsmen have to say. This dialogue between the designer and craftsman usually will result in a change in the design for a better product. Tod refers to the firm’s solution to this problem as a ‘travels’ process. However, it is a struggle with high rewards.

The firm is able to achieve this act of uncertainty by making the set of construction documents ever evolving along with the project is complete. The firm does not gradually add changes throughout the construction phase to better the design. One of the factors that make this possible is the idea of making part of the construction phase. The drafting helps communicate the thoughts of the designer and even the conversations with the craftsmen. Is it worth the time to keep them? With almost total dependence on the computer in the profession there are few companies that are focused on the art of craft. Tod and Billie believe strongly on the necessity of the hand through their built work as well as their prominent design process. There are at least six tools that are available in the market place. However, this is a temporary solution and the future of the availability of these tools is uncertain. The type of building program is crucial in order to keep the firm running efficiently. This is true for the design process but also financially. The firm chooses to work primarily on public works or high-profile projects. They have generated enough opportunities to take on a commercial project because the center of the design process would shift from a product to all about finances. Most of the work is focused on a commercial project because the center of the design process would shift from a product to all about finances. However, we must not let technology control us as designers, we must instead control the technology as Tod and Billie have done.

The studio as a whole believes in the use of the hand. The hand is the generalist and should control the tools used in the process of making. The attachment to the hand is because of their longing for what the ‘old’ Slowness. The engineer is not the one who is a designer who is a designer to work in fast pace. This new pace brings great results, one must be reminded to at what a pace. Tod and Billie believe that when the hand is involved in the work the studio is in a state where the mind is able to clearly comprehend the work and make decisions accordingly. For now the evolution of the craft and industrial design studio is inevitable. Science and principle in the field of architecture is becoming more important than ever. The firm’s process is not finalized until after the foundations are being poured. The design process continues into the construction phase which allows for changes according to the project’s needs. The firm encourages these changes in the field because they want to hear what the craftsmen have to say. This dialogue between the designer and craftsman usually will result in a change in the design for a better product. Tod refers to the firm’s solution to this problem as a ‘travels’ process. However, it is a struggle with high rewards.

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The Arts and Crafts movement was established in Britain around 1862 and was in response to the industrial revolution. During the revolution there was a rise of many new technologies, but with them came some concerns. Many believe that the Arts and Crafts movement rejected the machine however, this is not altogether true. According to Amy Dempsey, an art historian, the Arts and Crafts movement rejected the reproduction of the machine, not the machine as a tool.

Many of the concerns during the Arts and Crafts movement were raised according to social issues. The manufacturing plants that housed these new technologies were employing citizens to work long hours for little pay. The conditions in these factories were not suitable for working, and the workers were not able to even afford a decent place to live. This situation was extremely different than that of skilled craftsmen of the past. A person skilled in his or her craft was payed quite well and the working conditions were much safer.

The other opposition of the Arts and Crafts movement came in the form of artistic value. Designs during the time were being implemented with a lot of ornamentation. Something designers of the time began to question as to its purpose. The rejection of ornament was born from the Arts and Crafts movement. This is noted by one of the founders of the movement in his famous quote “have nothing in your house that you do not know to be useful, or believe to be beautiful.”

Even though the Arts and Crafts movement objected the notion of factories at the time, they did however agree with the idea of bringing good design to everyone which would carry over into the modern movement of the early to mid-20th century. During the late 19th century handicraft was not appreciated, much focus was deemed on the fine arts. The goal of the Arts and Crafts movement was to bring back handicraft and make art available for everyone. This was the motivator behind the design firm of Morris, Marshall, Faulkner & Co which consisted of the founder of the Arts and Crafts movement (William Morris) and other men with a likewise attitude toward design. The company was based on medieval guilds and employed craftsmen who designed and built the work. The goal was to create functional, beautiful, and affordable objects that art could be experienced by all; however, due to the raised wages for craftsmen and the cost of running the company they only were able to produce projects for the wealthy.

As mentioned earlier the Arts and Crafts movement helped to birth the Modernist movement of the early to mid-20th century which also focused on functional design that would be affordable to everyone. The Modernist movement was able to achieve this. We see Modernist chairs in many of the common places we go these days. The Modernist were able to achieve this by fully embracing the machine. This gave them in ways a reproducing machines and that lowered the cost of the products being made. This is noted by one of the founders of the movement in his famous quote “It is not the machine that is bad, it is the use of the machine.”

In conclusion the two movements had a common goal but only one was able to achieve it. This was because the Modernist were willing to fully embrace the machine and technology and the Arts and Crafts movement was not. In today’s time we have many new technologies that have yet to be fully explored in terms of craft. These technologies will bring with them new methods of making but we must be careful to reflect on the positives and negatives of the past to ensure that as designers we do not kill craft.
A term historically applied to the individual who was responsible for both the design and the construction of a project. During the Renaissance, a divergence appeared between the individual who prepared the project’s design, and the individual who was responsible for its construction. With the rise of design professionals in the late 19th century, the term fell out of favor and is used infrequently today in reference to design/build firms.
The workshop of Renzo Piano is a very special workshop with a very specific intent. The designer uses his workshop to visualize many of his creations. The workshop acts as a fusion of an architectural design firm and a craft shop. Most of the work generated inside Renzo Piano's building workshop consist of scaled models of his large architectural interventions. The projects that are visualized inside the building workshop are some of the highest priority in the firm. The firm itself is rather large, employing over 200. However, Piano is not able to touch the abundance of projects that run through the firm. This is why he has skilled people who run many of the daily activities while he stays in his workshop in France working on some of the firm's most prolific commissions.

Most of Piano's work is centered around the act of making. His work is one that is proud and celebrates the craftsman and their skills. Piano's process is one of great triumph and quality. During today's time it is rare to find an architect that is able to touch the abundance of projects that run through the firm. This is why he has skilled people who run many of the daily activities while he stays in his workshop in France working on some of the firm's most prolific commissions. Most of Piano's work is centered around the act of making. His work is one that is proud and celebrates the craftsman and their skills. Piano's process is one of great triumph and quality. During today's time it is rare to find an architect that is able to touch the abundance of projects that run through the firm. This is why he has skilled people who run many of the daily activities while he stays in his workshop in France working on some of the firm's most prolific commissions. Most of Piano's work is centered around the act of making. His work is one that is proud and celebrates the craftsman and their skills. Piano's process is one of great triumph and quality.
The Tamedia office building was designed by Shigeru Ban and was completed in 2013. The project is located in Switzerland and is known all over the world as an innovation in wood structure. The building design is made of wood that is comprised of three different components. The building design base is wood structure as components. The design breaks the building down into a series of wood structural systems. The building is constructed of multiple species of wood that are placed in relationship to their best function. The building's design minimizes the need for fasteners, which requires no features. This impact allows for parts of the building structure to be replaced very easily.

The Aspen Art Museum designed by Shigeru Ban is an example of the roof used for the roof. The structural system is a modular truss system. The module is composed of a different components. These components are made from wood products. The components themselves are made from a resin and paper combination. The components are then surfaced with a wood veneer giving them their finish. The pieces are joined using typical wood joinery. The interlocking pieces are made even more rigid by the use of metal fasteners.

The method of joinery and modular system that Shigeru Ban used in the truss system has not been used at any other scale or function other than a truss. However through the modification of scale the system could be applied at furniture scale and possibly even a larger building component scale.
This set of interactive block set was designed by the world renowned Japanese architect Kengo Kuma. This block set has been described as the Japanese version of the lego. The block set comes with a varying set of triangular shapes blocks that have a triangular relief cut in the two bottom edges of the triangle. This joinery allows the pieces to be stacked and assembled in many forms with just a single component piece. Kengo Kuma describes the blocks as ‘It’s not a heavy, masonry kind of wood block, but a light, transparent system just like what you see in traditional Japanese architecture.” The firm created a series of different scaled pieces of Tsumiki and they were displayed during the Tokyo design week of October 2015. The series of scaled blocks showed how the pieces could in fact be assembled for circulation of people. The exhibit housed a pavilion constructed of large blocks which was the same form as the image to the right.

The Chiordi joint was a concept that originated in historical Japanese toys. Architect and designer Kengo Kuma took the system and started to enlarge the modules in order for the system to be used at an enlarged scale for a multitude of functions. The heart of the system is the module which consist of two different component types. These components are joined using a method that requires no adhesives but instead are held securely with the connection itself. Once the component pieces are assembled they generate a module. These modules can then be multiplied to generate a variety of objects. Kengo Kuma used this joinery to generate a variety of furniture scaled pieces, a pavilion, and even a museum.
CASE STUDIES:
Wood Artisan

Artisan: One who creates or performs with skill or dexterity especially in the manual arts.
Sam Maloof was a furniture designer during the 20th century and is perhaps one of the most well-known American woodcraftsmen of the century. Maloof started crafting furniture from necessity when he returned home after being drafted into the army. He set up a small shop in his basement and proceeded to make furniture from salvaged materials. Maloof's furniture was soon noticed and he was published in a Los Angeles magazine which sparked his fame. Maloof had worked in his father's joinery shop in the early 1900s, so it was natural for him to develop a strong knowledge of joinery during his lifetime including presidents, actors, etc. He designed and manufactured from salvaged pieces to lavish materials. None of Maloof's furniture was ever drawn. Maloof responded to the question as to whether he drew his designs with the comment “the drawings are in my head”. Maloof’s work is one of the most intricate and well-detailed that you will see; he always felt that each piece was a story and he would return for the final finishing of the chair. This method and process was one that produced high quality pieces but came at a high cost.

George Nakashima’s route to a woodcraftsman was one of the unusual. He started his training with a bachelor’s of Architecture from Washington State University and continued his education at an architect with a masters from MIT. Nakashima then began traveling the world working on projects from India, Paris and eventually landing a somewhat permanent job in Tokyo before the war. The war perhaps had the biggest influence on Nakashima’s life. He was placed in a concentration camp where he had to work in the woodworking shop in the camp. Upon returning to the United States he decided to apply his lessons learned from crafting in Tokyo to his architectural work. He began traveling the United States looking at architectural works of the Arts and Crafts movement. During his study he realized what he called “a lack of craftsmanship”. One of the most influential men that Nakashima called is Frank Lloyd Wright who he called “a lack of craftsmanship”. One of the most influential men that Nakashima called is Frank Lloyd Wright who he called “a lack of craftsmanship”. One of the most influential men that Nakashima called is Frank Lloyd Wright who he called “a lack of craftsmanship”. Upon his analysis that he wanted to work at the furniture scale so that he could have complete control over his work from design to production. He settled with his family in New Hope, Pennsylvania where he set up a workshop and began crafting. He is well known all over the world for combining architects he studied was Frank Lloyd Wright and he found his craftsmanship to the point that one piece of material seems to flow into another. Maloof was a true craftsman in the sense that he objected the use of mass production. Maloof only employed 3 people to work in his shop. Three guys were in apprentices though the they had worked in his shop for over 20 years or his death. Maloof found every chair that was made in the shop; he had a prototype in which he would rough shape them and he would return for the final finishing of the chair. This method and process was one that produced high quality pieces but came at a high cost.

Born: January 24, 1916
Died: May 21, 2009
Artisan: Wood Craftsman
Education: Chino High School

George Nakashima's route to a woodcraftsman was one of the unusual. He started his training with a bachelor's of Architecture from Washington State University and continued his education at an architect with a masters from MIT. Nakashima then began traveling the world working on projects from India, Paris and eventually landing a somewhat permanent job in Tokyo before the war. The war perhaps had the biggest influence on Nakashima's life. He was placed in a concentration camp where he had to work in the woodworking shop in the camp. Upon returning to the United States he decided to apply his lessons learned from crafting in Tokyo to his architectural work. He began traveling the United States looking at architectural works of the Arts and Crafts movement. During his study he realized what he called “a lack of craftsmanship”. One of the most influential men that Nakashima called is Frank Lloyd Wright who he called “a lack of craftsmanship”. Upon his analysis that he wanted to work at the furniture scale so that he could have complete control over his work from design to production. He settled with his family in New Hope, Pennsylvania where he set up a workshop and began crafting. He is well known all over the world for combining architects he studied was Frank Lloyd Wright and he found his craftsmanship to the point that one piece of material seems to flow into another. Maloof was a true craftsman in the sense that he objected the use of mass production. Maloof only employed 3 people to work in his shop. Three guys were in apprentices though the they had worked in his shop for over 20 years or his death. Maloof found every chair that was made in the shop; he had a prototype in which he would rough shape them and he would return for the final finishing of the chair. This method and process was one that produced high quality pieces but came at a high cost.
ARTISAN’S COMPLEX:

Complex: A group of buildings that are related or a large building having different parts.
Similarly to most great designers and craftsmen of the 20th century, Sam Maloof had his own studio and residence combined. His compound was located in Alto Loma, California. The compound consisted of a cluster of buildings arranged on a rather large site. The compound served as a place of residence and work for Maloof and his family. The buildings on the site were designed in a craftsman style similar to that in the way Maloof worked. Many of the components of the buildings were crafted by Maloof himself including his signature door latch shown in figure 43. The interior of the buildings we designed in a craftsman style manner and house many of his greatest works of art. Due to the sprawling population in the area, the compound had to be relocated to a new site in the early 2000’s after the compound became part of the National Historic Preservation Act. Today the compound acts a museum of Maloof work on the new site just three miles away from the original homestead.

Program:
- Workshop 2300 SQ ft
- Finishing Room 1650 SQ ft
- Office 800 SQ ft
- Residence 2700 SQ ft
- Studio 300 SQ ft
- Guest House 1000 SQ ft

30
The Nakashima is a twelve acre complex located in New Hope, Pennsylvania. The complex served as the residence and workplace of designer and craftsman George Nakashima. The complex contains a number of buildings including residences, workshops, studios, and guest houses. The site was chosen because of its rural nature and attachment to nature. George Nakashima, being an architect, designed all of the buildings that are situated on the complex grounds. Through his designs, Nakashima incorporated designs generated in the workshops and studios by Nakashima, using natural forms and shapes to create work that one can no get by separating their work and residence. Through this connection, the craftsman lives and breathes his or her work.
Wood materials are cut from the tree in some fashion. These materials consist of different types of cuts. Each cut produces a different type of material for crafting. Depending on the selection of other variables in the crafting process the craftsman can select which type of material is to be used for the process of crafting. Products on the other hand are wood materials that have undergone a process and been altered. This process in an effort to stabilize the inconsistent material. Materials have a lot of character to them - with their uniformity usually not extending well to digital machinery. The process by which products are produced ensures uniformity which makes them more suitable for digital processes in which the craftsman has less control.
JOINERY: Wood

JOIN: The place at which two things, or separate parts of one thing, are joined or united, either rigidly or in such a way as to permit motion.
The joint is the second variable in the selection of craft. The key purpose of the joint is to make a connection between two pieces of material. The joint is made by a reduction of mass in at least two pieces of material generating a geometry that is interlocking to provide rigidity. Many joints still require fasteners or adhesives to make a structural connection. There are many standard methods of joinery already defined in the woodworking discipline. These standard joints have been altered over the years and many have become more complex in their geometry. With technology the joint has advanced. New methods of joinery have been developed from traditional joinery methods to better suit digital drafting tools and materials.
THE TOOL(S): TO CRAFT

TOOL: Something (such as an instrument or apparatus) used in performing an operation or necessary in the practice of a vocation or profession.
The hand tool has made constant development over the years. The key component to any woodworking tool is the chisel. A chisel is comprised of a series of chisel tips twisted around a cylindrical form. The arrangement of the chisel tips allow the chisel to perform certain tasks such as cutting, boring, planing, etc. The chisel picks the appropriate tool for the specific task. For instance, a rip saw has more aggressive-tooth pattern than that of a cross cut saw. This allows the rip saw to cut with more ease but will produce a much rougher cut. This rough cut is not a problem in the riping application because the rip's following will smooth the saw cut. The following pages go through experiments using the tools mentioned previously to generate a set of mock ups for a table. The hand tool has made constant development over the years. The key component to any woodworking tool is the chisel. A chisel is comprised of a series of chisel tips twisted around a cylindrical form. The arrangement of the chisel tips allow the craftsman to perform certain tasks such as cutting, boring, planing, etc. The craftsman picks the appropriate tool for the specific task. For instance, a rip saw has more aggressive-tooth pattern than that of a cross cut saw. This allows the rip saw to cut with more ease but will produce a much rougher cut. This rough cut is not a problem in the riping application because the rip's following will smooth the saw cut. The following pages go through experiments using the tools mentioned previously to generate a set of mock ups for a table.
The first step in crafting is to rough in material. The rough material is brought into the shop and marked out. Once the pieces are marked out the cutting process can begin to rough out the component pieces. This series of cuts consist of rip cuts and cross cuts. The tool of choice was a circular saw which allowed the craftsman to move the saw by hand and precise cuts were not necessary at this stage of development. The images below are capturing the process of cutting a turning blank to be used for crafting a dowel joint.

The next stage of the process is to take a square stock and turn that blank into a round dowel. This process is achieved using the lathe. The lathe is a machine that spins what is called a blank or a square piece of stock. The craftsman then uses a set of chisels that are controlled by hand to carve away material.
The next stage of this crafting process involves connecting the peg to the base. This process starts with the act of boring. This was achieved with a forstner bit. A forstner is comprised of a series of chisels arranged in a circle. The bit is placed into an electric drill which turns the chisels at a high rate of speed removing wood mass as it cuts. The bit radius is matched to the radius of the dowel to ensure a tight fit. Once the dowel is placed into the bore a secondary bore is needed perpendicular to the peg. This bore is to stabilize the peg in the vertical direction. This bore is made using a "twist" bit that is comprised of two chisels twisted around a cylindrical form. After the bore is complete a mallet is used to drive a spline through the bore securing the peg into place.
The crafting process of the top is very similar to the base. The connection is a dowel joining system. The first step in this process is to mill the lumber to the correct dimension. This starts with the surface planar which consists of a stationary machine with large chisel knives that remove material to provide an even surface. The next step is to move to the table saw where the pieces are milled to their final size before assembly. The skill saw is a stationary saw that utilizes a circular saw blade. The operator uses the fence of the saw as a guide to give very precise cuts. The next step of the process is to bore the holes for the pegs. The boring process is similar to the one on the base but the machine is different. The same forstner bit is used but the hand drill has been replaced with the drill press which has a fence and a secured table that ensures a perfectly vertical bore.

AFTER ALL OF THE TOP PIECES HAVE BEEN BORED, IT IS NOW TIME TO CRAFT THE SPLINES FOR THE PEGS. THE PEG SPLINES ARE NOTHING BUT A SHIM THAT EXPAND THE SPLIT IN THE PEG WHICH TIGHTEN THE TWO PIECES AND CREATE A SECURE HOLD BETWEEN THEM. THESE PIECES ARE CUT WITH A HAND SAW MAKING QUICK RIP CUTS. THE PIECES ARE THEN DRIVEN INTO PLACE USING A MALLET AND CUT FLUSH USING A FLUSH CUT PULL SAW. AFTER THE PIECES ARE FLUSH CUT THEY ARE THEN SANDED SMOOTH. THE TOP IS NOW ASSEMBLED.
The last part of the crafting process on the table is to connect the top with the base. This again is done with the similar peg joint used in the previous exercise. The first step is to make a jig that will allow the craftsman to mark the whole locations for the pegs on the top. After the locations have been marked the wholes can be bored in that location using a forstner bit. The bit was upsized by 1/16\" to ensure that all of the pegs would fit into the holes. The holes were bored using a hand drill because of the size of the material. The pegs in the base need to be split with a handsaw allowing a relief for the splints. Once the holes where bored the base pegs can be inserted into the top and the process of trimming and finishing the pegs can begin. The table is now complete.
The tools of the digital world are not completely new tools. Digital crafting tools are developed from traditional methods and adapted to the new computing technologies. The experiments on the following pages are generated using a CNC router. The router itself is no different than one that may be used in a stationary machine on a router table. The bit types, sizes, and usage are very similar between the hand router and the CNC router. The main difference is that the computer is in control of the router and material rather than the hand. All of the movements and tool cuts are prescribed to the router via computer. A router bit is a comprised of a series of chisels on a cylindrical shaft. That shaft is inserted into the router chuck which is spun at a rate of speed that removes material. Router performance is highly based off of the bit that is chosen for the job. There are spiral bits, straight bits, fluted bits, etc. Each of these bits remove material in a different way and give the user different results. The following pages experiment with traditional wood joinery on the CNC router to determine the outcome.
The first of the experiments starts with a simple box joint. This joint is a typical joint for many woodcraftsmen constructing boxes and joining two pieces of wood at a ninety degree angle. The process starts by generating a digital model in the computer using a model program, Rhinoceros 5 was the program of choice for this experiment, then the model is then brought into an additional program for developing tool paths to instruct the CNC to follow. The program of choice for this application was Aspire. Aspire allows you to program different passes on the material. This particular joint was comprised of only one tool path. The material was laid flat on the bed and a 1/4" diameter end mill was used to cut out the two joining pieces. The bit used was an up-cut spiral bit which extracts material upward allowing the piece and bit not to vibrate as much. The problem with the process is the direction in which the material is laying with regards to the bit. The bit can not produce perfectly square corners needed to ensure a tight joint with the box joint. As seen in the image to the right the process is precise but still doesn’t provide a nice joint. There is also some visible tear out and fraying from the bit vibration on the end grain of the cuts.

DIGITAL | BOX | FLAT

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This process building upon lessons learned in the previous cutting exercise. Knowing that we need the piece parallel to the bit we first start by cutting the two pieces out in flat on the CNC. Because the corners are on the inside of the bit turn, the pieces need to be perfectly 90-degree corners instead of a radius. A 1/2” diameter bit was used for this process to eliminate vibration and a small bit diameter was not required to make small cuts. The next step was to fix the pieces in the upright position which would make them parallel to the bit. Once aligned in the appropriate position the program was ran to remove the appropriate material. This pass was done using the same 1/4” diameter bit that was chosen for the first exercise. This was a somewhat risky move since we were cutting in a cross-cut direction and the vibration of the bit could lead to breaking the joining fingers off. These fingers were sized at 3/4” squares. I do not recommend getting any smaller than this because of breakout. The result of the cut pieces was quite nice with very sharp and crisp edges. The pieces were very precise and all angles were 90 degrees. There was a problem with fitting the pieces however. The pieces were cut so precise that the joint would not slide together. The joints had to be hammered together using a mallet which caused one of the pieces to break away. A solution to this would be to downsize the fingers in the digital model by 1/64” so that the pieces would slide together with ease.
This joint experiment encompasses multiple types of joinery. The first of which is the dado joint and the second is a peg joint. The CNC router was used to construct the complex joint. The experiment also uses a thicker stock of material to see the positives and negatives of using 2" thick material on the router. The first toolpath was used to generate the dadoed piece from the 2" cedar blank. The depth of the piece forced the use of a 1/4" diameter 5" length bit. The length was such that it cut a diameter of 1/4" at 1/8" from the surface, forcing a very rough cut as you can see in the photo to the left. The bit can experience so much vibration that it worms into the wood. A way of reducing this is to reduce the spindle speed or the speed at which the bit is turning but this is not a complete fix. The dado itself is made through the process of carving where the bit removes about an 1/8" of material at a time. The next toolpath was a bore that went through the cedar plank allowing a void for the peg to slide into. This proposed a problem because the peg was supposed to be square, but due to the radius of the bit, the bore came with chamfered edges. The last step in constructing the joint was running the toolpath for the tenon piece that intersected the dado joint. This piece was very precise except for the boring of the square hole which left chamfered edges similar to the cedar bore. Due to the small size of the peg it had to be cut using machinery tools. Because vibration would cause the piece to break off and become projectiles.
JOINT AS THE DRIVER:

Driver: A factor that causes a particular phenomenon to happen or develop.
The peg table is a project born out of materiality and its relativity to joinery. The project was generated from a board that was sawn on my sawmill. The board was sawn in a flatsawn manner which produced considerable amounts of cupping in the material. The pieces were nearly impossible to straighten. The only possible way to make a straight board from the piece would be to make rip cuts in the piece and laminate the pieces back together. The problem with this procedure is there were several knots in the pieces which would cause a severe problem in making rip cuts. The task became how to make a joint and design a table around the joining methods to connect the pieces. Dowel joints were the preferred method here and became the driving force behind the design and construction of the project. Test mock ups were made as seen earlier in the book to test the joints and minor changes were made to correct problems such as dowel and hole diameters. The table pushes the notion of a joint to the most extreme challenging its uses. Even the legs that the table sits on encompass the same joinery methods as a functional aspect.
PEG JOINT | TOP

PEG JOINT | BASE

PEG JOINT | TOP BEFORE FINISHING

FINISHED PEG JOINT | TOP

FINISHED PEG JOINT | BASE

INSTALLING SPLINTS | CRAFTING

TURNING DOWELS | CRAFTING

SPLITTING DOWELS | CRAFTING
The mortise table was born out of two variables: those being the material as well as the joint. The joinery method used in the construction of the table was the generator of the design. The mock-up joinery design seen to the right was an experiment of joinery done with no notion of the thought of a table. The pure aesthetic of the rough timber intersected by the clean surfaced plank was the inspiration for the project. The next step of the design process was to identify the rough timber to be used in the project. The piece chosen for its variety of grains but also the color: matched the cherry wood pieces being used for the feet of the table. The top was constructed out of white pine which color and grain matched that of the sap wood in the cedar plank. All of the joinery of the table was hand joined. The tools used during the joinery process include a pull cut Japanese rip saw, Japanese dovetail saw, and a set of chisels.
CHAPTER 4.0

THE CRAFT LAB:
The CraftLab seeks to integrate the notion of design with the art of making. This connection is possible through exploration of craft. Craft being the method in which we make connections between materials. The draftsman has been replaced by the craftsman in the Building DesignShop. The designer works alongside the craftsman in the shop to learn the skills of the craftsman while the craftsman learns the intent of the designer. The craftsman will learn to sketch in order to communicate with the designer and the designer will learn to craft in order to better understand the methods of joinery. This collaboration allows for a process that is constantly aware of what it means to make and construct, similar to that of the ancient Master Builders.

We have seen a similar phenomenon with the works of the digital design build shops. In these cases the craftsman has been replaced by the computer. However the CraftLab puts craft before technology. The lab does not altogether reject digital technologies but instead only suggest using them when they are appropriate for the task. The DesignShop believes that there are certain materials, and processes that are better suited for the digital realm than the hand. The process of tool selection is in fact a form of craft. The lab labels tools that do not involve the hands of the craftsman as digital this includes but is not limited to the computer cnc, laser cutters, robots, etc. The only tool that involves the hands of the craftsman is a power drill which is considered a machine. This lab includes tools such as saws, Sanders, planers, jigsaws, etc.

### 4.1 ABSTRACT | THE CRAFT LAB

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<th>RETAIL</th>
<th>3,400 SQ FT</th>
<th>GALLERY</th>
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<th>STUDIO</th>
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### 4.1 PROGRAMMATIC | SQUARE FOOTAGE

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<th>PROGRAM</th>
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The creative process is one that has many approaches. It is very evident in that the approach used during the phases of design is reflective of its outcome. With this notion shouldn’t we be more focused on the process rather than the outcome when it comes to design?

Crafting is a manner in which we think about constructing. The notion of craft is not altogether in the precision of the object but rather the process of its creation. Crafting should liberate the designer’s mind from constraints to allow the mind to think in terms of the hand and the material. The use of the hand dictates the craftman to think of every stroke of the pen, or every pull of the saw. This generates a thought process where the artisan is evident of every detail because he or she is in control and is limited only by imagination, not the tool.
Through experimentation I have learned that craft is not all dependent on the tool that is used, but rather the way in which the artisan uses the tool. As technology has advanced so has the tool, but the basic means in which we make have stayed somewhat consistent. For instance, the act of boring a hole into a piece of material with a brace is similar to that of using a drill press. The only variable is the amount of control the craftsman has over the tool. When boring with a brace the craftsman is in complete control of the tool and the direction in which it moves, speed, etc. When using the machine the artisan is limited to the constraints set forth by the tool.

With the notion of control in mind and understanding that the artisan must not be constrained by the tool in order to craft I looked to a way to master control over machine and even digital tools. This was made possible through the use of the jig. The jig becomes a tool in itself and actually allows the craftsman to perform certain operations that may not be possible by using the machine tool itself.
Module: a separable component, frequently one that is interchangeable with others, for assembly into units of differing size, complexity, or function.

The module consists of a series of components that are assembled in some manner to form a whole. It can be assembled in an algorithmic fashion to produce an object.

The joint is a crucial part of the module development because the manner in which the components are connected begins to determine the resultant or the module.

The number of modules required for an assembly is based off of the intended purpose for the piece and the intended scale. In terms of scale, the component pieces of the module can be scaled to enlarge the object itself instead of increasing a multiple of modules.
When crafting in a modular method, the craft is dependent upon the system and the module is the generator of that system. The photo above is a table constructed out of a modular method of thinking. The module continues to grow as more components are assembled to the whole. To generate a system from a module, a certain number of components must be determined to assemble a module. This gives the system an order. Without an order, the module will end up not connecting back to itself, causing the system to fail.
The site chosen for the Craftlab is situated along the Highline in New York City. The site was chosen for several factors, one of which was because of the rich history of the meat packing district in which the site is located. The area around the site was once used for receiving and distributing high quality meats around the city and surrounding context. The area is home to some very interesting architecture that consist of raw wood and brick construction. The architecture is not one of glamour but one of character. The meat packing business model of Manhattan began to decline heavily around the 1960’s leaving much of the developments vacant. Even though there are very few remnants of the meat packing business left in the area, the architecture and character still remains to this day. The area is in revitalization and has become a major spot for development in Manhattan over the past decade. The Highline which is one of the largest and most populated attractions in the city runs through the area. This area and all of its crafted architecture, moderately scaled buildings, and pedestrian traffic makes a perfect site location for the Craftlab.
The primary or large system of the building consists of its structural members. The structural framing consists of a post and beam construction. However, the system introduces another member and that being a joist. The joist as seen in the diagrams allows the spatial system to become non-dependent on the structural grid and fully conform to the spatial grid. The columns are placed 20'-0" o.c. in plan while the beams are placed 20'-0" o.c. in section. This allows for the small module(s) to completely surround the column grid while adding support to the cage of the small module.

The post and beam connections are made with typically wood working joinery while incorporating steel to address the long spans needed in the building. The structural members are made from laminated lumber that are then bored and through bolted with steel plating at connections.
CRAFTING THE SYSTEM(S)

The medium module consists of the spatial systems within the building. This mainly pertains to the shell of the interior volumes and their placement. The spatial system consists of volumes that conform to the overall 4'-0" grid of the small module. The spatial modules are nested inside of the small module grid allowing them to be dropped into place as the building is erected.

The spatial volumes of the building continue the notion of the module. The floor, wall, and ceiling plates are terraced into plates that are prefabricated and assembled on site. The floor plates consist of 20 panels that are connected with various, stronger steel connections. The ceiling and wall plates are of wood construction and use a typical wood stud wall with a few changes. The sheathing on the panels are made of 1x6 boards and consist of two layers running perpendicular to one another. This generates a similar rigid panel to that of the floor panel but is much lighter.
The small modular system which governs all of the other systems is laid out on a 4'-0" grid in plan and section. This grid is carved away to generate inhabitable space inside the structure. The grid is composed of members that are 3" square. The members are attached to one another through metal plating and wood joinery techniques which provide a rigid structure. The system is further supported by being anchored to the structural columns that are set inside the small modular grids.

The small module extends to the perimeter of the building providing an enclosing envelope. Glazing was implemented into the small module thus generating an enclosure that provides sustainable light into the interior of the building. Small modular elements become integrated with the medium spatial elements as the small module begins to puncture through the spatial modules. The modules then become a ceiling element providing space for mechanical to be run throughout the spatial modules.
The Craftlab site has a lot of variables. The first of which is that the site is situated at a corner which allows for great visibility and approach to the building. The next and possibly the biggest variable is that the site is situated along the highline. This placement allows a lot of views to end off the site and these views are not normally allowed in other locations. The highline is also an aesthetic feature that makes the site stand out. This side has an adjacent lot to the south and by placing a large wall on the south side we generate a buffer and set form the way in which the neighbor will design in terms of being adjacent to our site. The plan utilizes the space underneath the highline as service areas which is secure and protects it from visibility of visitors.

The floor plate(s) are laid out in terms of a 4'-0” grid which is the size of the module. The spaces inside the building conform to this grid allowing the floor plates to slide inside the modular grid as designed in the system. The modular system is built off of the large concrete wall on the south side of the building. "Heavy" programmatic elements such as restrooms, elevators, etc. Are placed on the southern wall. The design places more of the "lighter" program such as galleries, design studios, etc. Towards the north allowing much more light penetration into the building.

CRAFTING THE PLATE(S)
The craft lab is housed in the cellar level and the first three levels above grade in the building. This height allows great views and approach to the Craftlab from the street as well as the highline.

The section in to the right shows how all of the systems work in unison vertical. The section was designed similarly to the Floor plates in that the beams are laid out on 20'-0" centers and are encased by the small modules. This section shows how the spatial modules become nested into the small modular grid.

To make the building fit the surrounding context in terms of scale and economic factors four floors of luxury residential apartments were added to above the craftlab. With the added apartments the building tops out just over 150'-0" in height.
The final model presented here is a sculptural representation for the building placed on the site. A method of modular thinking was implemented in the design of the model similar to that of the building. The notion of wood joinery used to combine the modular elements are present in the design of the model. The model is representational of the architectural impact the building has on the site. That being a sculptural object generated from the act of making.
PRESENTATION:
A cohesive design process through the small, medium, and large has been proven to be flawed through observation. At least when utilizing the methods of the module.

The module has many advantages in terms of a scalable design process. Its multiple, constructed of sizable components, and able to be expanded and contracted as a whole. This fluctuation allows the module to conform to multiple uses at the small, medium, and large.

However, considering the observations the module must become secondary to the design piece, especially as the piece reaches a certain scale. Even though the module is very flexible as a module itself, it becomes very constraining with pieces at the medium and large scales. The piece should be freed from the module and the module should become an implementation onto the project itself. This way the module does not control the project from its original intent.

In some manner the module begins to lose the act of crafting altogether. Through experiments the module was found that it naturally wanted to conform to a fabricated state rather than that of a crafted state due to its duplicable attributes. A reflection of the process showed that the module was not leading to the original intent of the crafting but the implementation of the module rather than the crafting of the module itself.

The modular system should be abandoned for a process that is more forgiving to the element of scale while preserving the character of craft. Relying more heavily on the traditional design-build notion than before, the revisited process must encourage the freedom of the craftsman much more than that of the modular process.
BIBLIOGRAPHY:


