CRAFTING A NEW SENSIBILITY: (HAND)CRAFT, CIRCA 1996

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Craft: (from the OE: craeft: power) to make with skill—implication of manual skill or dexterity, a special skill or art.
Webster's New International Dictionary

Craft is a human skill. It results from thoughtful attention to and intimate knowledge of production process, tool(s), material character, and acts of physical co-ordination and skill in applying this knowledge to production. The act of attention that results in tectonic craft can be considered as an act of educated, inventive thought directing a skilled tool for production (the trained and practiced hand). Traditional models of production craft enjoin thought and tool within the same body: the crafts-man, without whose skills it is impossible to produce the crafted tectonic.
author

Craftsmanship is highly valued in architectural production, and the pursuit of craft is strongly reinforced by professional curriculum and pedagogy. However, labor costs associated with traditional craft practices make the crafted building a luxury purchase, only affordable for a small elite market. Thus, pursuit of traditional craftsmanship and the crafted tectonic indirectly contribute to the marginalization and isolation of the profession within the construction and development industry. Architectural professionals seems to face a choice between lessening their share of profit, becoming niche-market specialists, abandoning craftsmanship as an outmoded pursuit, or reconsidering the valuation and use of traditional craftsmanship in production.[1] This paper puts foreword a proposal for the latter choice, reconsidering the role and contribution of most costly element of traditional craft: the labor of a craftsman's human hand in production. The limiting or removal of the human hand from the production process may, arguably, shatter the model of traditional craftsmanship beyond recognition as craftsmanship. However, I would like to set aside the question of whether this redefined process is, or is not, craftsmanship. Instead this paper seeks to discuss the process of performing craftsmanship in response to changing distribution of knowledge, skills and memory between human, tool, and machine—and in response to the more responsive, synthetic interface developing between human and machine.

Initial limits on model and discussion need to be briefly defined at the outset: Traditional craftsmanship involves a thorough, intimate, and practical knowledge of raw materials, tools of production, techniques for using tools of production, combined with the mental attentiveness, physical skills and co-ordination to apply this knowledge to production. In well-crafted assembly pieces fit together tightly without gaps, cracks or rough edges, and the form, proportion, and piecing of the assembly complement and harmonize with the materials selected for production. Good design, or at the very least, a graceful proportion is implied by craftsmanship, although it is possible to have good craftsmanship on a poorly designed object. The process of craftsmanship involves not only production of product, but also consideration of relationships and emotional and sensual associations between craftsman, process, product, and consumer. Architectural craftsmanship is the sensibility of craftsmanship applied to the process of designing, fabricating and assembling a building (on a site).

To discuss redistribution of knowledge, skills, and labor during the process of architectural crafting, a clear distinction needs to be made between the role of physical body, tools, expended labor-energy, physical skills, mental skills and knowledge applied by a craftsman during production, the product, and the traces left on the durable product by the process, tools and hand of the craftsman needs to be defined.

For this purpose I borrow from Henri LeFebvre's distinction between material and *matériel*:

"Materials are indispensable and durable: stone, brick, cement, and concrete, for example...Matériel, by contrast, is quickly used up; it must be replaced often; it is comprised of tools and directions for their use, and its adaptive capability is limited: when new needs arise, new matériel must be invented to meet them...In the construction industry, new techniques and equipment fall under this rubric. This distinction may achieve a certain operational force inasmuch as it can be used to discriminate between what is ephemeral and what is more permanent: to decide what is worth preserving or reassigning to new tasks, and what deserves only to be rejected or relegated to a subsidiary role.[2]
Henri LeFebvre, *Production of Space*

Applying this definition to the craftsman's process, the following tripartite distinction is established: the durable—raw materials selected and processed by a craftsman; the ephemeral—the *matériel* of labor and thought invested by a craftsman in designing and performing the processes of production; and the synthesis of durable and ephemeral—a crafted structure. This paper focuses on the ephemeral and the ephemeral incorporated into product (the craftsman's hand and its trace). Thus, it focuses on the *matériel* of a craftsman's process, and the traces of *matériel* synthesized into the product.

Craft: (from the OE: craeft: power) a trade or occupation that requires skill in use of the mind and hands.
Webster's Encyclopedic Dictionary

Although it is not explicitly stated in definitions, crafts, and particularly construction crafts, are not performed with hands alone. Rather, the skills of constructive craftsmanship are skills in manipulating hand-extensions (tools) that extend the capacity of a soft fleshy hand, brittle fingernail or tooth, to cut, shape, and manipulate materials. Therefore, further distinction needs to be defined between (human) hand, the source and application of energy (labor) and the working extension (the tool) in skill performance:

tool: (from the Old English) (n) anything which, held in the hand or hands assists a person to do manual work; the working part of a machine; a machine tool.
machine: (F.) (n) an apparatus, made of organized, interacting parts, which takes in some form of energy, modifies it, and delivers it in a more suitable form for a desired function; a thing or system resembling such an apparatus in acting with regularity as a result of the interaction of its component parts.
machine tool: (n) a power-driven machine fitted with a tool or tools for gear and screw-cutting, boring, planing, drilling, etc.
Webster's New International Dictionary

Held in the hand, the tool evolved *as an extension of the human hand* to assist performance of manual work, and powered by the energy stored and converted by human muscle and body. Machines convert energy from one form to another for the *purpose* of replacing human effort in the performance of work. The machine tool is a machine extended with a tool or tools. Therefore, it is possible to consider hand energy and machine energy as playing roughly analogous roles in production. Labor(energy) of a hand during work can be replaced by labor(energy) of a machine. A craftsman can hold in his hand and use a tool that is at once a (hand)tool and a (machine)tool—powered by machine and human simultaneously.

Yet, a craft is "a trade or occupation that requires skill in use of *the mind and hands.*" In craft production the hand is not just a physical hand using energy to move (or direct) a tool, it is a physical hand directed by a mind. Human substance contributes more than energy to craftsmanship, and that quantity, defined as skill in using (moving) the tool, has both mental and physical components Therefore it is useful to further distinguish human contribution to craft in terms of mental and physical *matériel*:

...human substance can be both matériel and (an ephemeral presence in) material. The flesh-body is matériel, a tool whose substance and energy is consumed during production. Mental effort used to direct the body-tool and solve the problems of design and construction is also matériel—reinvented to fit a particular circumstance, discarded when the work is finished. When construction is complete the sweat, muscle-mass, and metal energy expended by the body no longer remain. However, the result of mental matériel—expressed through the skill, craft and sensibility—remains behind embedded in the (material fabric of the) place.
author, "Appalachian Summer Rain Place" monograph, 1993

Hand and body are tools for a mind to direct using disciplined, inventive mental effort. This convention is borrowed from performance. Actors, dancers, or athletes learn to differentiate mental directions to the body from physical actions of the body to allow themselves to direct and control the motions of the body more precisely while learning performance patterns. Defining the body as a tool, a performer treats and directs it like a tool learning and applying its capabilities to the task of performance. Once patterns of performance are mastered, a performer lapses into a state akin to a craftsman's empathetic extension into his tool.

Considered in this way, a craftsman's hand is a fleshy-tool permanently appended to the end of the human arm. The mind of the craftsman provides direction to this tool, as it manipulates (directs) other extensions and tools during the work of crafting a product. A machine is capable of replacing the human effort (energy) that powers a tool during the *performance* of work, but not the mental effort that directs it.[3] If the movements of the hand are considered as movements of a tool, than tools that resemble hands can (and have) been constructed out of materials more durable than flesh. It is not a far step to append this more durable hand-tool to a source of energy other than the human body, and thus create a machine-hand-tool.

With these parameters established, it is possible to address the following questions:

Must the hand in hand-crafting remain the hand of the body or can that hand also be redefined as a mental-hand directing a skilled hand of production (which may be skilled but not human).

What are the implications of a redefined model of (hand) craft in post-industrial mass-production of elements and assemblies?

The answer to the first question lies in an ambiguous area of cultural valuation and signification, rather than in any characteristic a human or machine hand imparts to a product. Metallic-hand(tool) and fleshy-hand(tool) can attain similar tolerances of fit, form, and surface character during production. Each hand(tool) can accurately perform directions given by an operator who is well versed in program, capacity of tools, material, and means of production available. Given a similar level of quality control in raw material selection and process performance, end products of both hand and machine production are both adequate for the needs of assembly.[4] Thus, one could conclude that while there are differences in performance criteria, neither hand is wholly a superior choice for moving tools during production. Rather, it seems more useful to consider machine and human hand as variations of a single tool—a hand of production. Consider this hand of production as analogous to a wrench, and the difference between human and machine as analogous to the difference between an adjustable jaw and a sized-socket wrench: the two able to perform many of the same tasks within an adequate range of performance, with differences in specificity, flexibility, strength, accuracy, etc., in performance and repetition of tasks.

Yet given performance equity, humans still place higher value on man-made products. Products that have no other characteristics of craft (fit, precision, functionality, comfort, etc.) retain (hand)craft appeal if the tooling marks of human participation in the production process are strong.[5] (Hand)tool marks are the primary indicators consumers use to authentic human participation in production of an assembly.[6] This suggests valuation responds not to inherent quality, but to cultural signification and preference for products created by flesh-human over the silicate-metal human analog (anthro-centricism). The strongest key to human valuation of craft is not the physical

characteristics of the product, but the consumer's perception of a human trace in the product. Thus, if human sensibility and relationships in other aspects of the design and production process are made apparent to consumers, they should accept a connection of (hand)craft with factory production.[7]

This bring the paper to its final question: What are the implications of a redefined sensibility of (hand) craft in post-industrial mass-production of elements and assemblies?

Industrialized Production of all the parts can really be rationalized only in the course of the manufacturing process, and work on the site will be entirely a matter of assembly... It is quite clear to me that this will lead to the total destruction of the building trade in the form that it has existed up to now; but whosoever regrets that the house of the future can no longer be constructed by building craftsman should bear in mind that the motor car is no longer built by the wheel-wright.
Mies Van der Rohe, *Industrialized Building*, 1929.

As Mies Van der Rohe suggests, production in the modern construction industry occurs at two scales and locales: the field and the factory. Contemporary design and fabrication of building components occur primarily in the factory. Site construction, except in the case of boutique production, increasingly is a process of semi-skilled or unskilled labor quickly erecting and connecting a pre-specified, pre-fabricated kit of parts. Questions of site and factory are different. Standardization shapes the factory, but on-site construction is a mediation between the universal products of the factory and the particular(exceptional) context of a specific site.[8] While both offer considerable potential for renewing craftsmanship, this paper will limit itself to questions of the factory.

The architect, as specifier, wields considerable influence over the composition, materiality, and design of sub-assemblies, and thus over craft in the factory. Control of factory production offers potential for the renewal of craft—particularly at the scales of detail and surface that most directly affect the experience, comfort and sensual pleasure of a user. The factory and its tools are potentially the tools of the architect, and understanding material character and industrial production of construction are concerns of architectural education.

This is not a new argument. Forty years ago, Walter Gropius eloquently made the argument against "the atomizing effect of the subdivision of labor which has exploded the coherence of the pre-machine society" and in favor of re-integration of design, production, and response to human need in his essay "The Architect within our Industrial Society."[9] Gropius sought re-integration of design and production through alliance with builders and manufacturing specialists in creatively charged design-build teams based on the medieval guild tradition.

Post-industrial manufacturing and design trends offer another alliance: human, chip, and machine-tool, a team where at least presently human direction is dominant.[10] When considered in terms of current manufacturing practice this scenario might appear impractical, but consider the following: One architect using a PC, Auto-CAD software, and plotter is a direct synthesis of design-production for architectural drawings capable of replacing a small firm. In proto-type modeling for the automotive and industrial design industries it is presently possible to create a product mock-up in virtual space, transfer the instruction set developed for the virtual model to a programmable tool array that fabricates a physical 3-D external mock-up in one afternoon.[11] It is not a far step to consider a similar application of process to industrial production of architectural products and components. Flexible re-tooling makes limited customization of architectural components possible (akin to the stylistic choices possible in a family of automobiles built on the same chassis). An architect-manufacturer alliance could provide consumers with a package that includes creative services, production services, and product.[12] This hybrid alliance of human-chip-machine-tool potentially performs like a craftsman, but produces like a factory. In this synthesis, human provides ultimate direction and invention of *matériel*, repetitive mental directions are programmed into a chip-brain, and machine provides physical skill and strength for production. This suggests that if architects seek to become the "remaining human participants" in factory production of components for defining constructed space (the artisan-craftsman at the heart of the synthetic human-machine) they need to consider the capacities, biases, implications of using this enormous (hand)tool for design and construction.

A craftsman uses a tool in performance of a process, but the tool is not the process. Craftsmanship is a human process and occurs in context of human culture. Traditional craftsmanship acknowledges the cultural web of obligations, relationships, and associations between the artisan-producer, process, tools, product and consumer that provide the context for production. Industrial production (Fordism) fragmented production to increase the economy and speed of production performance, and ignored human relationships that are part of and provide the context to production. Post-industrial production reverses industrial-era fragmentation of production (through design-production synthesis) but it does not address the accompanying fragmentation of relationships between craftsman, product, and consumer—"basic human needs" to use Gropius's term.[13] The human needs considered by craftsmanship are pragmatic. A craftsman wants his product to give its owner pleasure and comfort, to be useful and effective in use, durable and easy to maintain. A craftsman wants owners to both cherish and use his products. For architects this is a human, social, emotional, problem of how to make people adopt, "care," and give a place significance in their lives:

Significance is a personal relationship (of fit, empathy, accumulated associations and—sometimes, comfort and pleasure) between a person and a place. Cultural significance can be thought of as a field of agreement between personal choices. If enough people make a personal choice of significance, a place becomes significant to a town, a city, a region, or a nation. Habits of significance can be passed down within a culture through formal or informal acculturation.

A designer cannot create significance, only conditions for significance to grow...the final gift of significance comes from each individual who passes into and through the place, and is momentarily touched by its presence.
author, *journals*

...accumulated significance (the result of momentary truths that come to one in the everyday solving of problems becomes the sensibility that shapes a life, a building, or a made thing. It is the significance of discovering and learning those experiences that make

a life more interesting, more comfortable, more interesting and curious then using these lessons to make one's own production more sensible.
author, "Appalachian Summer Rain Place," ACSA Monograph

Significance for the craftsman comes from solving problems from within the problem in empathy with self pleasure, process, product, and the sensual enjoyment of the user. A craftsman builds not in response to abstract rule for design but in response to cultural precedent and preference, functionality, and his own sensual satisfaction—the traditions of his craft. He derives pleasure not only from pleasing himself, but from the usefulness and sensual pleasure his products give to others The craftsman considers the needs of production and profit, but also a personal agenda of relationships between himself, his process, product and the consumer that is a very human mix of satisfaction, pleasure, and sensuality.[14]

...But if the human factor is becoming more and more dominant in our work, architecture will reveal the emotional qualities of the designer in the very bones of the building, not in the trimmings only; it will be the result of both good service and good leadership.
Walter Gropius, *Scope of Total Architecture,* (p.98) 1955

While these trends support the continued pursuit of craft as an educational and professional goal, the didactic emphasis placed on physical (hand)craft skills in the learning and pursuit of craftsmanship needs to be re-examined. However, it is not simply a matter of shifting didactic emphasis from physical to mental skills of craft. Craftsmanship is a symbiotic process, mastery of the mental process is reached through mastery and perfection of the physical skills and process, and the two are not easily separated. Through mastery a craftsman also reaches a state where the tool is no longer tool, but an empathetic extension of his human sensuality and skill. In this state of extended sensuality the interface between mind, hand, and tool fades from conscious attention, although the limits, bias and use of the tool are well considered in the process.

Post-industrial design-production tools potentially offer a human artisan-craftsman a synthesis of design and production, an enviable amount of control over product and process, and a transparency of human-tool interface similar to empathetic extension in the craftsman's process.[15] However, these tools still isolate the artisan-craftsman's human body from direct physical sensual participation in process and problem—disrupting the intuitive empathetic cycle of reference, evaluation and adjustment in reference to the human hand and body. Nor does it renew the human relationships between the craftsman, body, product, and consumer that seems essential to the human valuation of craft. While post-industrial tools are potentially better tools for the pursuit of craftsmanship in design, in some ways they might be worse, unless driven by a sensibility that brings the sensuality and empathetic extension of a craftsman's sensibility for material, scale into the machine of a scope far beyond the interface of a hand and wrench, at the same time that it removes his body from direct participation in production.

As the post-industrial artisan-craftsman sits like a spidery ghost at the center of his machine-tool, the question becomes can he/she sensually extend an empathetic sense of craft, material, scale, and body into the machine, how far,...and how does one prepare the next generations of designers to bring themselves into the machine.[16]

NOTES

1. The arguments presented in this paper owe much to Walter Gropius's arguments in the essay "The Architect within our Industrial Society" from the book *Scope of Total Architecture.*
2. The distinction between material and *matériel* is made in Henri LeFebvre's discussion of social space. (Production of Space, p.105.)
3. Though it is not discussed, mental direction is no longer an exclusively human domain. Repetitive direction (like those that form the foundation of traditional practices) can be encoded, recalled, and repeated by modern computers. Innovative (creative) mental direction (invention and re-invention) is still considered a human domain.
4. For example: a well designed and built machine hand is capable of exceeding the accuracy of the human hand on most production criteria, and of extended accurate repetition without damage, breakage, or boredom, the human hand is more flexible during prototype design and production process (less re-tooling to make radical innovations in *matériel,* the easy accessible and cross-connect to the innovative mind, which is hard-wired to the tool). Machine produced products usually prove less variable, more consistent and reliable in their production tolerances and performance use standards.
5. Emerging-world (hand)crafts or primitive antiques are excellent examples of this phenomenon. In tourist areas it is not uncommon for craftsmen to produce work of lower finish quality than they are capable because it sells better.
6. Since the beginning of mass-production, manufacturers have been well aware of this preference and produced machine-made products with false or copied marks of the hand (carving, chiseling, wiped paint finishes, etc.). Present machine directed tools perform at a level of developmental complexity and skill that makes differentiation between the product of human hand and the machine copy increasingly difficult for consumers. For example furniture manufacturers now use programmable robot-arm arrays that can copy chiseling and fine carving from a master craftsman's prototype with such accuracy that many consumers cannot distinguish from the copy from a master craftsman's work. This carving 'studio' consist of a human master and an atelier of computerized apprentice carvers.
7. Scandinavian craft production of home and office furnishings is an excellent example of factory design and production that contains clear traces of human sensibility that originate in the design of the object, not means of production.
8. Even the universal site of modern construction, bulldozed flat, paved and surrounded by a ring of catch-basins is a mediation with the existing conditions and context of place which must be acknowledged in the design process even as they are obliterated.
9. While Gropius argues against the atomizing effect of industrial production on work, he ignores the contribution of many social and cultural trends to societal atomization (for example: sub-urbanization, automotive commuting, single-use zoning).
10. The trend in post-industrial factory production is to replace the human labor, dexterity of unskilled workers with a chip-machine-tools (robots). Current robotic arrays are capable of reproducing complex sequences of tasks and motions to fabricate and can assemble products more quickly and accurately than the human-machine-tool assembly line. Fast, flexible re-tooling is also possible (within a pre-set range), because the tooling sequence is stored and recalled as a set of re-programmable instructions. Remaining human workers provide mental direction and organization and supervision of production process rather than the power and skill to perform the process. Many post-industrial innovations were first applied to mass-production in industries like the automotive industry, where product price and labor cost were high enough to cover costs associated with technology development.
11. Presently an intermediate step of translation from design to production instructions is required in many fields, but compatible interfaces between tools used for design and tools used for production are becoming more common, blurring the line between design, production, and design of the production process.
12. Alliance with manufacturing makes fundamental changes in the role and autonomy of an architectural practice. A single robotic factory tool can cost millions of dollars. The cost of a factory full of such tools is far beyond the economic grasp of most individuals or small partnerships.

Simplified schematic of a construction assembly process:

Selection of Raw Material(s) --> Pre-Fabrication (preparation of raw materials for use)--> Fabrication (cutting and fitting material for assembly)--> assembly of Fabricated Elements--> Product

MATÉRIEL of the AMERICAN CRAEFTSMAN PARADIGM

1) TRADITIONAL KNOWLEDGE (accumulated results of trial and error, and observation transmitted from person to person by through language and by example in the craft tradition.)

of TOOLS
knowledge of tools
knowledge of techniques and directions for the use of tools during production,

of MATERIALS
knowledge of the life-cycle, behavior and characteristics of material
in its raw state,
during fabrication,
in material assemblies,
knowledge of material response under duration loading and exposure.

2) APPLICATION SKILLS (physical) needed to apply accumulated knowledge to the process of production. These skills are learned by example and investigation and refined through an ongoing process of observation, critique, and practice.

for TOOLS
practiced physical skills needed to:
use tools,
perform pre-fabrication preparation, fabrication and assembly tasks during the process of making a product.
repairing, maintaining, and re-setting the tolerances of tools.

for MATERIALS
practiced observation skills needed to:
select appropriate material for production
identify the nuance and variation of materials within a class
identify the relative quality of materials within a class
read, understand and diagnose the interaction of tool and material during production

3) ANALYSIS & ADJUSTMENT SKILLS/KNOWLEDGE: (mental and physical)
The ability of the craftsman to adjust the matériel of production to variations in the characteristics and behavior of materials AND TOOLS.

4) SIGNIFICANCE: (social and cultural valuation) The last component of the craftsman paradigm is more ambiguous - it is the presence of the ephemeral in the durable -- that is the trace of the man in the product -- and it is on this foundation that most arguments against machine vs. hand craft rest.

The latter two are presently beyond the capacity of machines.

	Transmitted Knowledge:	Application skills (physical):
DESIGNER:	selecting material for production (specification) identifying the nuance and variation of materials within a class identifying the relative quality of wide range of materials in the raw state, in a pre-fabricated state, in material assemblies, knowledge of the life-cycle, behavior and characteristics of material knowledge of response of material and material assemblies to duration loading and exposure	
LABOR (Semi-skilled): Crew & Line bosses Equipment maintenance etc		identifying nuance and variation of a single type of materials. identifying the relative quality of single class of materials applying tools to material during production repairing, maintaining, and re-setting the tolerances of tools.
LABOR (Unskilled): Specialized to a task	techniques and directions for the use of a (single) tool during production	response of a (single) material to a (single) tool during fabrication

Simplified schematic of a construction assembly process:

Selection of Raw Material(s) --> Pre-Fabrication (preparation of raw materials for use)--> Fabrication (cutting and fitting material for assembly)--> assembly of Fabricated Elements--> Product

13. Note: Gropius's sensibility (influential in American modernism) differs considerably from the sensibility that shapes traditional craftsmanship. Therefore, Gropius's sensibility and response to human needs "un-obscured by the veil of traditionally imagined historical needs," and his sense of craft are essentially different from the traditional craftsmanship of guild precedents he cites.
14. What often differentiates factory production in the USA from craft production is the focus of the former on the means of production, and the consideration of the latter for both means and ends. That is the factory production (designed by product engineers) is shaped by considerations of material, and production process, and initial (visual) sales appeal and packaging.
15. Post-industrial interfaces (pioneered by Apple) mask technical direction sets behind a "user-friendly" set of instructions designed to work with learning, experimentation, and logic behavior used in everyday life. Because a user functions "normally," the tool becomes transparent allowing the user to focus more attention on the task or product—this is similar to the transparency a craftsman's tools develop as he masters their use.
16. While this paper advocates empathetic extension into process, product and context, it is *not* arguing against the objective clarity of critical regard. I argue here for an architecture of both empathy and intellectual clarity. The human pysche can find "The satisfaction (resulting from beauty)...important for a full civilized life" through the sensual and cultural empathy of the craftsman's sensibility. (Quote from Gropius, The Architect in Industrial Society, p. 76)

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