

# Creative Practice and Critical Reflection: Productive Science in Design Research

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## Introduction

Designers and design researchers have struggled for many years to find useful models for their work. Researchers in the Design Methods Movement, for example, found that seeking a new “scientific” basis for designing—one that would lead to a methodology of design practice, as well as a framework for research—was important. Whether this effort was successful is open to debate because of conflicts among the various proposals, leaving the issue open for ongoing exploration. As an alternative to approaches such as *design science*, *dialectic*, or *rhetoric*, which have given intellectual strength and direction to research and creative projects, we focus on a model and a strategy that provides a different perspective on the struggle of a practicing designer and artist as he or she seeks to develop creative work. The strategy is called *productive science*, or *poetics*.<sup>1</sup>

There are three central features of the strategy: the identification of the essential *functional elements* of design, the exploration of these elements with an appropriate degree of precision, and the integration of these functional elements in design and artistic practice. The functional elements include the materials of embodiment, the manner or technique of execution, the form as a unifying structure or idea, and purpose as the ultimate goal of the work. In turn, the exploration of these elements is the process of designing, divided into phases or stages, such as finding a meaningful problem, doing background research, finding creative ideas, developing those ideas in the process of creation and iteration, and finally, synthesizing a work that affects and that has emotional integrity. Finally, the integration of the functional elements of design in practice is the creation of a work with compelling correctness of expression—both in achieving a practical purpose and in bringing appropriate emotional force to the solution.

This brief summary points toward the creative activity studied in productive science. But a further consideration requires attention as well: reflection on the implications and principles that

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emerge in the course of creative work. *Reflection* is what leads to a systematic study of human creation based on principles rather than idiosyncratic practices, thus leading to productive science. The goal of this article is to explore the potential and significance of productive science as a strategy of inquiry in design practice and design research.

#### Four Strategies of Inquiry

As with most of the methods and strategies of intellectual investigation, the strategy of productive science may be traced to the ancient Greeks. Aristotle was the first person to employ the method of productive science in the investigation of the human-made world. For him, productive science, or poetics, covers any kind of making, including both useful products and the products of all of the fine arts. An example of this kind of inquiry is recorded in the *Poetics*, a treatise on the art of tragedy.<sup>2</sup> By Aristotle's approach, a work of art or an artificial "thing" is a unified structure or synthesis of parts. The unifying structure of the work of art is what Aristotle calls its *form*, while the parts are the *material* that is unified by the form.<sup>3</sup> By this approach, the problems of making are stated and solved in terms of the requirements of the work of art that arise from the process of what Dewey calls thinking, doing, and making.

The method of productive science has been used by many writers and researchers in the investigation of literature, the visual arts, music, and, in the twentieth century, the design arts. For example, a variation of this method was important at the Bauhaus and in the work of Laszlo Moholy-Nagy.<sup>4</sup> As in the case of other writers, Moholy-Nagy also emphasized the role of inspiration that comes from nature and the importance of the unifying structure or form as the interconnection of parts or essential elements in the creative process.<sup>5</sup> But productive science has also been an important method for designers and design theorists holding quite different positions on the nature of design. An example is Herbert A. Simon's *The Sciences of the Artificial*.<sup>6</sup> Richard Buchanan argues that the structure of Simon's book follows key structural features of Aristotle's *Poetics*. He suggests that Simon's book could be regarded as a modern variation of poetics and productive science, although he also observes that Simon used and positioned the approach well within the framework of his positivist philosophy and his vision of a design science. In other words, Simon ultimately turns the pattern of productive science into a strategy of design science, seeking the basic elements that underlie the complexities of the material world and investigating the processes and mechanisms by which those elements are combined to yield to the world of experience and the cognitive processes of designing.<sup>7</sup>

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2 Kenneth A. Telford, *Aristotle's Poetics: Translation and Analysis* (Chicago: Henry Regnery Company, 1961).

3 *Ibid.*, 63.

4 L. Moholy-Nagy, "Design Potentialities," in *Moholy-Nagy: An Anthology*, Richard Kostelanetz, ed. (New York: Da Capo Press, 1970).

5 George Santayana, *The Sense of Beauty: Being the Outline of Aesthetic Theory* (New York, NY: Dover, 1955); Roger Sessions, *The Musical Experience of Composer, Performer, Listener* (Princeton, NJ: Princeton University Press, 1958); and Telford, *Aristotle's Poetics*.

6 H. A. Simon, *The Sciences of the Artificial* (Cambridge, MA: The MIT Press, 2001).

7 Richard Buchanan, "Thinking about Design: An Historical Perspective," in *Handbook of the Philosophy of Science*, A. Meijers (ed.), *Philosophy of Technology and Engineering Sciences* vol. 9 (Amsterdam: Elsevier, 2009).

John Dewey's *Art as Experience* employs a variation of productive science, positioned within the framework of his philosophy of pragmatism and his theory of logic and inquiry.<sup>8</sup> In *Art as Experience*, Dewey focuses on what he calls "an" experience, rather than discussing what we often refer to as experience in a rather vague or general sense. An experience, Dewey argues, has form and structure. It is a coherent interaction with the world—with a beginning, middle, and end that embody the activity of a person and the conditions of the environment. It moves from resistance and struggle to a consummation in a completed work, whether the "work" is practical, intellectual, or aesthetic. The work is not an object; rather, it is an activity. And the activity has a mixture of practical actions, intellectual considerations, and emotion. Inquiry, as Dewey argues in *Logic*, "is the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole."<sup>9</sup> The strategy of inquiry, in this case, is "to seek the resolution of theoretical, practical, or productive problems and move toward the advancement of knowledge in the various branches of human learning and activity."<sup>10</sup> Productive science focuses on the discipline and methods of "making," the properties of the made-thing, the analysis of the functional elements of products, and the synthesis of all these functional elements.

However, two other important strategies of inquiry also contribute to clarifying and distinguishing the enterprise of productive science. The first rhetorical inquiry focuses not on methods of making and the production of human-made products, but on the ethical and inventive character of the artist and designer, and his or her ability to effect social change through argument, communication, and action. The second, dialectical inquiry, is adopted and used in many fields, among them design. Donald Schön, in his book *The Reflective Practitioner*, calls for "reflective conversation" in the work of designing.<sup>11</sup> As Buchanan notes, the central feature of dialectical inquiry is to overcome oppositions, conflicts, and contradictions encountered in everyday life by bringing them within a system or ordered whole.

These four strategies—productive science, design science, rhetorical inquiry, and dialectical inquiry—have significantly shaped the methods designers use. According to Buchanan, they also point toward two of the philosophical problems that are significant issues in design practice: the problem of *parts and wholes*, and the problem of *means and ends*<sup>12</sup> The interplay of these four strategies, Buchanan summarizes, helps to explain the otherwise bewildering diversity of design practice and design research in the twentieth century.<sup>13</sup>

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8 John Dewey, *Art as Experience* (New York: Capricorn Books, 1958).

9 John Dewey, *Logic: The Theory of Inquiry* (New York: Holt, Rinehart and Winston, 1964), 104–05.

10 Buchanan, "Thinking about Design," 411.

11 Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York: Basic Books, 1983).

12 Buchanan, "Thinking about Design," 412.

13 Ibid.

However, the potential of productive science as a strategy of inquiry is still emerging, and its significance deserves further attention. For this reason, I illustrate the importance of this strategy with a concrete example drawn from my own practice-based design research.<sup>14</sup>

### **A Concrete Example of Productive Science**

This inquiry is an example of what I consider “practice-based research” in art and design. What the term means to me is that the inquiry began in the practical experience of my work as an artist and designer. It continued through practical experimentation with a technique of production, and it has yielded results that have both practical and theoretical value. An idea expressed by Dewey speaks well to the complex mixture of art and philosophy that one may find in my work: “Philosophy is said to begin in wonder and end in understanding. Art departs from what has been understood and ends in wonder.”<sup>15</sup> I can say that the philosophical foundations of productive science and the philosophical problems of the unity of art and design and emotional expression are central to what I have come to understand about fiber art and design through the inquiry.

The *central question* of the inquiry was whether fiber art and design could serve a practical purpose in enhancing the quality of sound in interior spaces and, at the same time, serve an aesthetic purpose in adding beauty to an environment. The problem of sound absorption has been addressed in a variety of ways by different professions. The professionals addressing the issue have tended to use unappealing materials in the form of panels attached to walls or suspended from the ceiling. Solutions are typically hidden from view or, when visible, are not aesthetically pleasing. And if solutions are aesthetically pleasing and not hidden from view, they do not have a high quality of sound absorption. The selection of materials is more often random, rather than based on any systematic analysis of acoustic properties. In short, there is limited understanding of the acoustic properties of materials, and the research in this area is often inadequate. Where testing of acoustic properties has been conducted, most of the materials are simply not adequate to solving the problem effectively. The answer to the question, “could fiber art serve purposes that are practical, as well as aesthetic?” is that it can under certain, qualified conditions. Finding the nature of these qualifications is more than a matter of artistic intuition and sensibility. The artist’s intuition and the engineer’s common sense tell us that the fiber art work must have some proportionality to the total surface area of the environmental space. Beyond this, we know little more, unless we have specific knowledge. Gaining this knowledge and understanding how it bears on the practical and artistic matter of creation is one of the problems of inquiry, calling for what I earlier referred to as the

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14 Kaja Tooming, *Toward a Poetics of Fibre Art and Design: Aesthetic and Acoustic Qualities of Hand-tufted Materials in Interior Spatial Design*, PhD thesis, Goteborg University, Art Monitor Series (Stockholm: Intellecta Tryckindustri, 2007).

15 Dewey, *Art as Experience*, 270.



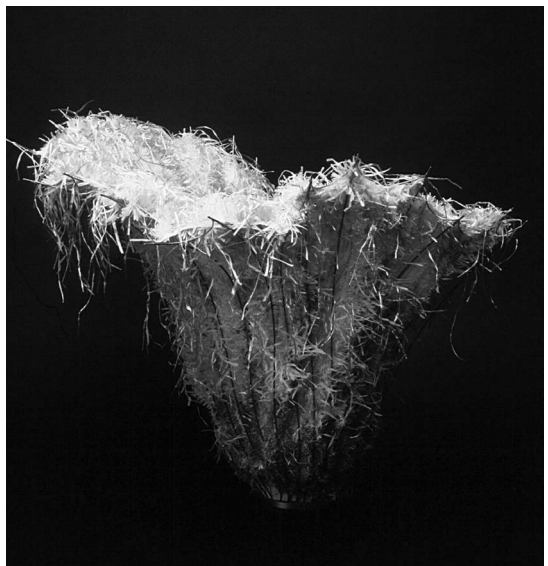
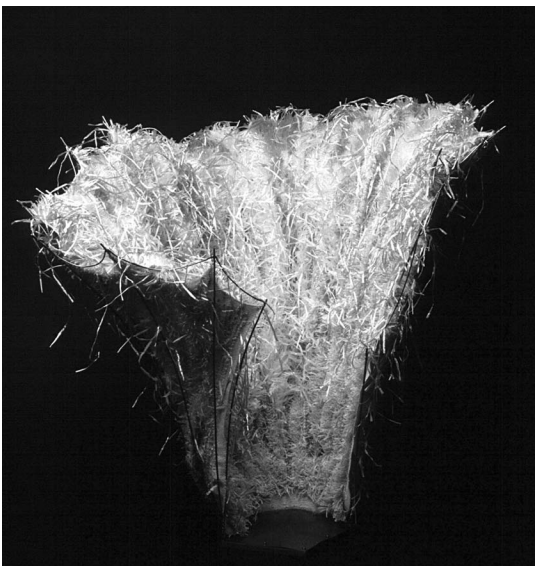
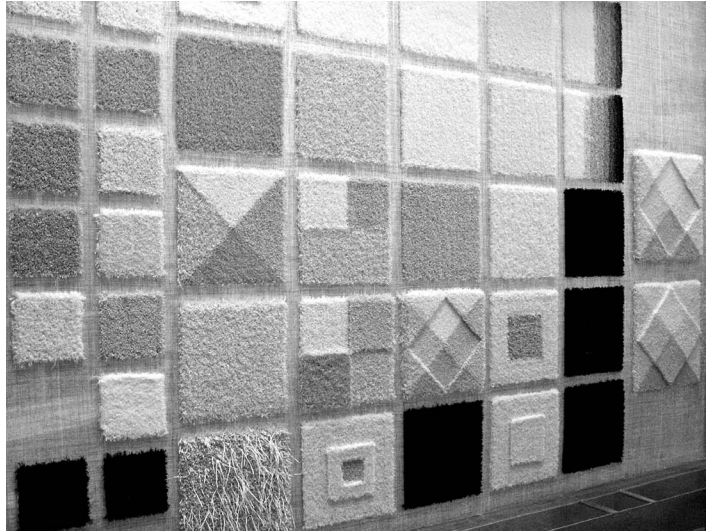


Figure 1 (top left)  
Hand tuft technique.

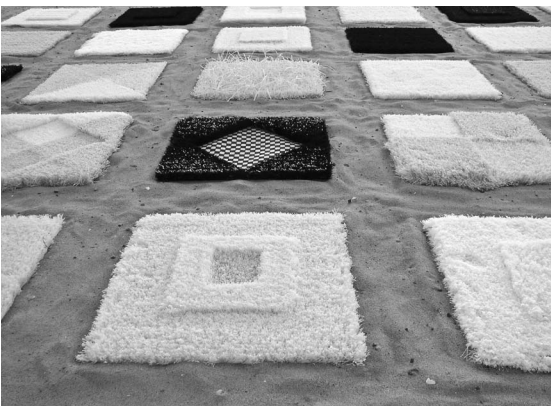
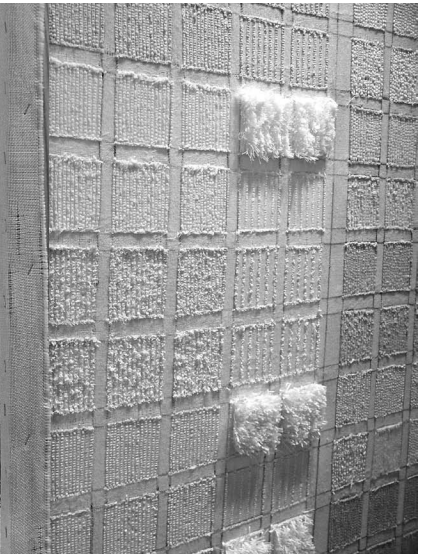
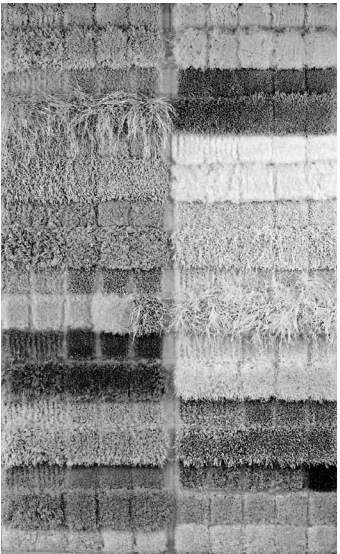
Figure 2 (top right)  
Hand tuft samples on frame.

Figure 3 (bottom left)  
Kaja Tooming, *Celebration*, 1999.  
61 x 61cm.

Figure 4 (bottom right)  
*Celebration*, 1999. Reverse view.

exploration of functional elements with an appropriate degree of precision—in this case, the exploration of material properties and a manner or technique of execution.

The inquiry pursued two closely related lines of investigation. The first issue was the nature of materials and the manner or technique of production. It was necessary to investigate the acoustic and aesthetic properties of a variety of fiber materials. In all cases, the materials were subjected to careful acoustic testing, based on recognized methods of measurement of sound absorption and speech transmission. However, simply testing the fiber materials was not enough. The materials also had to be formed in such a way that they could be tested, and hence the testing was a study of the technique of handling the materials as well as a study of the materials themselves. The technique used in this research is called *hand tufting*. The hand tuft technique designates the modern



see page 23 for figure captions

weaving technique by which thread is shot into a vertically suspended backing by means of a hand-steered machine that is driven by compressed air (see Figure 1). The history and characteristics of this emerging technique are not well addressed in the literature. Hand tufting is a powerful technique of modern weaving, when it is used appropriately and with imagination (see Figures 1–4).



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Figure 5 (opposite page, top left)  
Kaja Tooming. The view of the *Backside* exhibition at the Town Hall Gallery in Kuressaare, 2003.

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Figure 6 (opposite page, top right)  
Kaja Tooming. The *Backside* exhibition.

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Figure 7 (opposite page, center left)  
Kaja Tooming. *Backside*, 2003.

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Figure 8 (opposite page, center right)  
Kaja Tooming. The view of the room: *Backside's* back side and reliefs.

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Figure 9 (opposite page, bottom left)  
Kaja Tooming. Floor installation *The Japanese Garden* with hand tufted rug elements and sand. Detail.

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Figure 10 (opposite page, bottom right)  
Kaja Tooming. Installation *The Japanese Garden* with hand tufted rug elements and sand. Detail.

The second issue, already foreshadowed in the technique of hand tufting, was the artistic and design use of the technique in creating forms that possess some measure of beauty and charm (see Figures 3 and 4). In formal theory and design methodology, this is called “synthesis,” but this is a dry, academic term for the struggle of the artist and designer who seeks to bring together all of the functional elements of his or her craft, art, or discipline. How do we study the *informed intuition* and *inventiveness* of the artist and designer? This question is a critical one because simply understanding the acoustic and aesthetic properties of materials is not enough. The materials must be formed, and formed by an idea that is progressively realized in the work of art and design.

To pursue these issues, one must settle on a specific strategy of inquiry, and here, my work turned toward productive science. This pursuit involved a deliberate decision to turn away from what is sometimes called design science. Design science, as understood by some investigators, seeks an explanation of issues of design practice by a reduction to the underlying materials of the world and the mechanisms of the mind by which decisions are made in art and design. Instead of conducting a study of the physics of the materials or a psychological study of the fiber artist or a consumer study of the fiber art and its reception by an audience, I turned to the functional elements of art and design—the elements that are necessary for the existence of a work. In the traditional and contemporary use of this strategy, I explored four elements:

- The manner of production;
- The materials employed by the artist and designer;
- The qualities of form in the created work; and
- The purpose or function to be fulfilled by the work.

I assumed, in accordance with the assumptions of this strategy, that artistic and design creation is the *integration* of these functional elements by whatever means or methods are suitable to the individual artist or designer.

The inquiry began with an analysis of the manner of production (hand tufting) and the fiber materials (various kinds of fibers and threads). It continued with an exploration of form and function, testing through artistic creation the combinations of manner and material that may be suited to the final product. In the course of the work, I developed small samples and then tested them in a solo exhibition titled “Backside” at the Town Hall Gallery.<sup>16</sup> The “Backside” exhibition was the first step toward formal synthesis of the elements of fiber art in expressive forms (see Figures 5–10).

Based on the results, this preliminary step led to the second phase of the research: the creation of an ensemble of fiber art works for a specific architectural environment, where aesthetic

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16 Tooming, *Toward a Poetics of Fibre Art and Design*, 77–83.

and acoustic problems are the central issue. I was using fiber art as a design element in a complex and culturally important building: the Jonsered Manor, known in Sweden as the Jonsered herrgård (see Figure 11).<sup>17</sup>

An elegant dining room presented a difficult problem of poor acoustics (see Figure 12). When many people were in the room, echoes created a disturbing level of noise. The architects have been cautious in trying to solve this problem because of preservation ambitions; obvious solutions were ruled out because they conflicted with the historical nature of the room. The design constraints imposed by the historical setting of the room suggested that a subtler approach was needed to deal with the poor acoustics. Given these constraints, a fiber art approach began to make sense. The goal was to meet two needs simultaneously: (1) to add an appropriate aesthetic expression using fiber art work, enhancing rather than detracting from the experience of the room, and (2) to design the fiber art work in such a way that it might help to improve the acoustics of the room. Behind this, there also had to be careful consideration of the larger context of the building, including historical, social, and cultural factors.

The first step was to investigate the environment through perception, observation, interpretation, and reflection on what factors should influence the final creation of forms suited to the history and traditions of the building and its contemporary use. Experiencing the dining room in its entirety, as a place of social interaction and communication, was important. This is the “experienced whole,” which brings together the perceptual elements and the meaningful relationships of the space and adds to these the expressive qualities of human interaction. A key point here is that fiber art becomes an art of design when the purpose of creation is more than pure aesthetic expression. In this case, the work of fiber art no longer exists as an isolated object but becomes part of an environment, supporting and sustaining practical experience in the lives of human beings.

My work took Dewey’s idea of *an* experience as a beginning point. However, I have developed Dewey’s idea in a somewhat different direction than he did. I found important a focus on three considerations, or three aspects of experience: *perception*, *meaning*, and *emotional expression*. Of course, Dewey discusses issues related to these three themes, but for the practicing artist and designer, the role of perception is very significant and deserves careful attention as the first step in one’s interaction with the environment of daily living. Therefore, a major part of the early research focused on perception: the perception of materials, sound, and other features of the materials with which the designer must work. This task is an analytic, scientific one. I have found phenomenology to provide an

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17 Ibid., 85–104.





Figure 11 (top left)  
Jonsersed Manor, Sweden.



Figure 12 (top right)  
Dining room.

initial framework for such considerations and to be helpful in the observational method used as part of the investigation. A theoretical foundation for this work comes from the phenomenologist Edmund Husserl, and the existential philosopher and phenomenologist Maurice Merleau-Ponty.<sup>18</sup>

Perception is important, but how we interpret perceptions and make meanings out of them is also important. That is, the role of meaning is also important for fiber artists who conceive of their work as an art of design. In fact, the designer works in an environment that is rich in associated, traditional, historical, and cultural meanings. Any new work of design must engage and interact with such meanings if it is to be successful in supporting the experience of people in their concrete environment. For this reason, I have also found structuralism to be helpful, particularly in the form developed by Roland Barthes.<sup>19</sup> The idea that an environment possesses a deep structure of parts and relationships is very useful to designers. It enables them to explore the details of placement of objects and artifacts in an interior space, and it also enables them to better understand how other meanings—social, cultural, and historical—enter into consideration in the activity of making meaningful experiences.

Ideas about perception and meaning come together in Dewey's concept of experience, but under a third consideration that also is critical for designers: *emotion* and *expression*. For Dewey, emotion is what unifies an experience, whether the experience is artistic and aesthetic or intellectual or practical. In short, if designers are to be successful in supporting the practical experience of people living in interior spaces, they must explore the emotional and expressive aspects of the final solution. As Dewey argues, emotion is not something separate from an experience—something added onto everything else. Rather, it is the heart of an experience—the unifying “glue” of daily life. The deepest hypothesis of my work was that *perception, meaning, and emotional expression work together in creating a unity or wholeness in the products of design and in*

18 Edmund Husserl, *Ideas: General Introduction to Pure Phenomenology*, trans. R. B. Gibson (1962; London: Collier-MacMillan Ltd, 1969); Maurice Merleau-Ponty, “Eye and Mind” in *The Primacy of Perception: And Other Essays on Phenomenological Psychology, the Philosophy of Art, History and Politics*, J. M. Edie, ed. (Evanston: Northwestern University Press, 1964); and Maurice Merleau-Ponty, *The Structure of Behaviour*, trans. A. L. Fisher (Boston: Beacon Press, 1963).

19 Roland Barthes, “L'Activité Structurale,” in *Essais Critiques* (Paris, Seuil, 1964).

*the experience of the people supported by such products.* Exploring this hypothesis in the different stages of the analysis and synthesis is what the research was ultimately about.

Productive science has an affinity with what is sometimes called “practice-based research,” and it is certainly more precise than the vague descriptive phrase, “research through design.” Productive science suggests the artistic logic of someone who studies a situation, reflects on all of the factors that bear on creation, carries out the work of realizing an idea in concrete form and materials, and then reflects on the total experience to gain deeper understanding of an art. Intuition is informed with the results of analysis, just as this research and work have been informed with the initial technical studies and then with a careful consideration of the environment of the Jonsered Manor.

### **Reflections on Principles and Results**

What I have learned from this strategy of inquiry and its organization of the methods and techniques of research is at times surprising and at other times a confirmation of initial ideas. For example, some of the fiber threads that were tested are nearly ideal in sound absorption, as determined by acoustic science.<sup>20</sup> This result was a surprise not only for me but also for the acoustic engineer who performed the tests. We also learned the specific absorption properties of all of the materials that were tested. In addition, the weaving technique of hand tufting appeared to contribute to the quality of sound absorption because of the intertwining of fired threads and the use of unglued backing.

The solo exhibition, “Backside,” demonstrated that audiences found the color and forms of the fiber models to be warm, inviting, and intimate, surprising, natural, and almost sacred (see again Figures 5–10). In fact, many viewers were surprised at the combination of aesthetic and practical purpose. We were encouraged that this is a reasonable direction for further artistic and design exploration. The “Backside” exhibition also generated more knowledge on how to use the technique of hand tufting, and how to use it in unusual and innovative ways.

The creation of the ensemble of fiber art works for the Jonsered Manor led to more complex insights. For example, it led to the recognition that fiber art and the hand tuft technique could be used to create sculptural forms. There are other examples of fiber art sculpture, but none that we know of are formed with the double-weave hand tuft technique (see Figures 15–16). This new and innovative process in the field of fiber art deserves further exploration. I also learned—and this is a personal learning related to professional development as an artist and designer—that it is possible to create fiber art works deliberately within a specific

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20 Tooming, *Toward a Poetics of Fibre Art and Design*, 61-72.



Figure 13  
Kaja Tooming, *Flow*, 2007.



Figure 14  
Kaja Tooming, *Flow*. Detail.

environment, and that a working method that grows out of analysis and research can achieve a degree of alignment with the traditions and history of that environment (see again Figure 13–16). No strategy of inquiry or method of research can predict the final quality that an artist or designer can bring to a work. At best, we hope to explain the factors that bear on the problem and gain insights that can better inform creative intuition.

The matter of acoustics is more precise. Acoustic testing at the Jonsered Manor yielded a few important findings. First, the choice of fiber materials and the form of their presentation resulted in an absorption pattern that closely approximated a so-called ideal absorber, as understood in acoustic engineering.<sup>21</sup> This result was expected, based on earlier testing and analysis. Second, testing at the Jonsered Manor further revealed that the total surface area of the works of fiber art was not large enough to considerably reduce reverberation time in a vast, hard-surfaced space like the dining room of the manor. That is, further use of fiber art would be needed to effect a major change in enhancing the quality of sound in the room. This result also was not unexpected. Indeed, the initial proposal suggested three alternatives, each of which would have increased the surface area of the fiber art works. An appropriate proposal was selected from among the three for a variety of reasons. Nonetheless, the test provided an encouraging proof-of-concept that calls for further exploration.

21 Ibid., 59–72.

Figure 15  
Kaja Tooming, Sculptures *Growing I*  
and *Growing II*.



Figure 16  
Kaja Tooming, *Growing I*.





Of special interest for further work is the possibility in the idea of mobile fiber art screens. Properly designed and fabricated, screens of fiber art could easily support the idea of a “reconfigurable” room or even an office space. The dining room of the Jonseder Manor is a grand room, with high ceilings and many hard-surfaced tables. Sound control in this space is certainly a challenge. In other rooms and other kinds of work or social areas, fiber art works (e.g., screens) could function effectively. However, we have also learned that fiber art and design, to be used most effectively, should be site specific. It should grow as much as possible out of the unique features of each situation and environment.

### Significance

The final step in poetic inquiry or productive science is a reflection on the nature of unity and emotional expression in a work of design. It speaks to the questions: “What is the significance of this work, and how does it advance understanding and practice?”

The significance of this work is quite practical. It contributes to the body of knowledge that may be useful for architects, designers, and design researchers as they pursue the practical problem of enhancing the quality of sound in interior spaces. We have discussed the nature and value of the double-weave hand-tuft technique, the specific acoustic properties of a variety of fiber materials, and how the exploration of form and function might contribute to enhancing the experience of interior spaces. These matters are certainly an aspect of the unity that we have sought in understanding how fiber art becomes an art of design. Unity is found in an integrative discipline of thought and action, informed with appropriate and relevant technical knowledge.

However, this research and work also offers theoretical significance. This approach contributes to the theoretical foundations of the study of design and to the place of fiber art and design in the broader domain of the design arts and sciences. This first form of contribution is the demonstration of the strategy of *productive science* as a strategy of inquiry. As Buchanan has argued, this strategy has emerged from time to time throughout the twentieth century, and the present work shows its application to a new area of design thinking as I explored the aesthetic and acoustic qualities of fiber art and design.<sup>22</sup> Although the strategy of productive science is perhaps unfamiliar in its name and its formal rigor, it is nevertheless quite familiar in the common sense of practicing designers and artists. And, of course, it is familiar to some design researchers, although not necessarily by the name of productive science or poetics. As noted earlier, the central features of the strategy are to identify the essential functional elements of design, to explore

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22 Richard Buchanan, “Strategies of Design Research: Productive Science and Rhetorical Inquiry,” in *Design Research Now: Essays and Selected Projects*, R. Michel, ed. (Basel: Birkhäuser Verlag AG, 2007).

these elements, and to integrate them into design and artistic practice. By elaborating on this strategy and developing an inquiry around its concepts and methods, we have contributed to further use of the strategy in other inquiries.

The second theoretical contribution concerns the nature of unity and emotional expression. If the first contribution lies in the area of strategy and method, the second contribution lies in the area of principles. We have sought principles in three unities: the unity of the *perceptual whole*, the unity of the *meaningful whole*, and the unity of the *wholeness of experience*.<sup>23</sup> In the course of our research, we have discussed the ideas of Merleau-Ponty, Barthes, and Dewey—leading figures of phenomenology, structuralism, and pragmatism. By combining some of these ideas in succession, we have found principles in the progression of unities that lead to emotional expression. This has yielded the *necessary intelligibility of emotional expression*, which arises from the intimate connections of form and purpose as they work together to integrate materials and the manner of human action. This is the basis for the compelling correctness of the artist's decisions in creating a work of art and design. It is the criterion that we sought for artists and designers through our reflections on principles and unity.

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23 Tooming, *Toward a Poetics of Fibre Art and Design*, 109–18.