SOUND THINKING IN FOURTH ORDER DESIGN

A Thesis

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by

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To my wife,
thank you.
To my wife,
thank you.
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PREFACE

This paper explores the role of design within our universal and contemporary culture and will use language related to the most general understanding of design. This language includes references to a client, project or initiative, a designer, a process, and an end user. Each of these roles are understood in an economic sense in which there is a demand for something, a client willing to provide this thing, a designer willing to design this thing, a process that each of them follow, and a user who desires that thing resulting from the process.

Valid and relevant to this paper in its early stages, these linear relationships will grow to occupy new relationships and more dynamic roles in later stages of reading. Instead of a client, the reader may infer an organization with a quantifiable issue or a situation which brings about a problem that requires a solution. Instead of a marketable product or service, the thing may come to reference a more abstract solution. The user may become a general beneficiary of the solution, instead of a consumer in the previously mentioned economic context. Further, although the process is almost always dynamic, the designer remains a designer regardless of task or official title. I ask the reader to bear each of these distinctions in mind as he or she progress through the following exploration of the various roles of design.
INTRODUCTION

The purpose of this paper, and indeed the body of my thesis work, is to test the boundaries of the design discipline. Design has long been recognized as a problem-solving task, but there is a strong current within the design profession that recognizes design as an activity beyond that of simply fitting together pieces of a given puzzle. If these puzzle pieces are not fit together with an understanding of what the final image should look like, or how it should function, the effort has little chance of benefiting its recipients. The tasks of communication and integration for design in the problem-solving process make it uniquely qualified to accept a larger role in organized efforts.

In any worthwhile consideration of design issues, it is necessary to define the context in which the issues, or design itself, will be discussed. That said, this paper will be an exercise in continually altering the context of discussion. My goal is to define a path from the common understanding of the designer as a problem-solver to an awareness of the designer as a problem-setter. This will require a recognition of the designer and the designer's skill set in places we might not expect. To do this, we must first identify what it is we are looking for.
As an increasingly dynamic field, design has come to be defined by the “nature of thinking it entails. It is integrative, rather than merely analytical; visual rather than merely abstract. It is fundamentally about invention, not research.”¹ This “nature of thinking,” which we will refer to as design thinking, is easily characterized in the practice of narrowly defined design disciplines such as two- or three-dimensional design, which, for the purposes of this paper, we will refer to as graphic design and industrial design, respectively. Additionally, this definition forms the foundation for our widening of the domain of design. We will identify roles for design thinking in areas not commonly associated with the aforementioned disciplines. Ultimately, I hope this new understanding brings an awareness to previously unrecognized forms of design; the good and the bad of which we have all experienced, whether we know it or not.

Dr. Richard Buchanan is responsible for formulating the theory of the existence of four orders of design. As a Professor of Design in the School of Design at Carnegie Mellon University, one of the central themes of his work is the idea that design thinking can be applied to a widening circle of human problems that are no longer adequately addressed by traditional methods and practices. Of his numerous publications, the most relevant for our discussion are the papers “Wicked Problems in Design Thinking”² and “Branzi’s


Dilemma: Design in Contemporary Culture.” The former identifies the expanding role of design thinking in tasks beyond the two- and three-dimensional and presents design thinking as a field of study. Branzi’s Dilemma attempts to build a critical framework around this distinction by asking questions about how we identify and categorize design thinking.

Subsequently, I will be standing on Dr. Buchanan’s shoulders in framing this widening domain of design while contributing my analysis of its occurrence and application in a broad cultural sense.

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FOUR ORDERS OF DESIGN

“There are many organizations which have no idea what a ‘designer’ offers, and have never used one; but for whom design thinking is looming as a coming dawn.”⁴

Buchanan’s theory of the widening role of design creates a hierarchy of four orders of design activity, each building on the skills and accountability of the previous order without discarding the responsibilities of each. Buchanan does this by identifying an underlying skill, which we have identified as design thinking, in traditional design disciplines and mapping its occurrence and relevance in activities that go beyond the traditional expectations of design.

This hierarchy begins with the most fundamental of design tasks, design of the two-dimensional. Graphic design is the perhaps the most traditional design discipline and forms the foundation of the four orders. The second order concerns the design of objects or the three-dimensional, primarily the task of the industrial designer. The following two orders remain linked to the preceding orders, but lack a direct literal or physical result as the previous two. However, in much the same way that the graphic or industrial designer improves the document or the object through their interaction with

it, the third and fourth order designer creates a more efficient *process* and identifies a more appropriate *purpose*, respectively, providing a more desirable result beyond that of simply improving a literal document or object. The third order designer is concerned with the process that eventually guides the problem-solving of the first and second order designer. The fourth order designer moves beyond questions of how processes are structured, or solutions achieved, and investigates the purpose behind the design effort.

![Diagram of design categories](image)

Figure 1 is a revised illustration from Golsby-Smith, “Fourth Order Design: A Practical Perspective,” 5.

The third and fourth order represent the furthest theoretical outposts of the domain of design. However, third order design is routinely offered as a design-specific service today and even fourth order design is beginning to gain recognition as a legitimate design task. In fact, these design efforts, recognized or not, occur daily on a variety of levels. Additionally, if one considers that this widening domain is simply an influence that design has on the organizations with which it is involved, from governments to
groups worldwide, the widening domain of design becomes clear. Figure 1 illustrates this widening domain. From the designer’s obvious role in the two- and three-dimensional, we can trace a path for their involvement in the third and fourth order, contributing the skill of design thinking to determining processes and purposes, respectively. Although it will be clear how the role of the designer expands, it will also become clear that the definition of who a designer is, expands as well.
The first and second orders of design are the most commonly recognized design disciplines and many likely view design services beginning with the two-dimensional, namely graphic design, and ending in the three-dimensional, such as industrial design. Although not a beginning and end in the practice of design, these first two orders do well to reflect the skill of design thinking that eventually take the practice beyond this initial focus.

In the first order, the graphic designer is charged with crafting a message that has been generated by a client for a viewer or user. The designer will work within, for instance, the boundaries of a document to better express the message that it should contain. The designer’s efforts are concentrated on the elements that make the document an aesthetically desirable artifact. A client has provided specifications for the job that may include instructions on typography, images to be used, and color preferences to name a few. With training in producing effective two-dimensional communication through the combination of these elements, the designer is interested in exercising skill and opinion as to the two-dimensional arrangement of these items. The graphic designer is hired for the technical expertise of choosing the best visual options from a given set and works as a skilled craftsman to integrate all aspects of the client’s objectives.
The second order designer, just one step removed, is involved in a similar role. The client has provided specifications for a product to an industrial designer who is trained to work within constraints in shaping an object. Again, the designer uses his or her skill and interest in choosing the appropriate means for executing the design. Surfaces will be shaped and materials will be altered based on the expertise the designer has in integrating these variables within given restrictions.

In each case, the designer understands that the boundaries of the thing with which they work “are stable and defined, while the form is unstable and undefined.” The client has provided concept and content, and the designer relies on his or her experience and expertise to give a better expression to this concept and content. Figure 2 indicates the flow of interaction and value contribution of the designer as resting entirely within the document or object with which they work.

Figure 2 is a revised illustration from Golsby-Smith, “Fourth Order Design: A Practical Perspective,” 6.

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Our culture has great familiarity with these two narrow disciplines of design, and consequently the first and second order of design. With increased skill and experience, the designer will naturally feel comfortable with increased participation in the process within which they work and begin to offer their skills as third order services.
THIRD ORDER

To this point, the designer has been isolated between two communities, functioning in a place of tension. This tension arises from the designer’s duties in adhering to processes established by a client, while satisfying the user with a desirable artifact. In this role of translation, the designer strives to meet the client’s objectives, but might realize a different design would better satisfy the user. With limited involvement in the process that determines the ways in which the user will be satisfied, the documents and objects that comprise the designer’s work remain inert in their objective and potentially limited in their impact. However, while this may negatively affect the reception of the artifact, this tension has the potential to work to the designer’s benefit by widening his or her involvement in both ends of the process.

In a situation where the designer is able to float more freely between the client and the user, the duties of his or her job naturally expand. With an interest in helping the client achieve success with the purpose behind the overall effort, the designer may participate in identifying the elements to be included in the design. Instead of receiving a fixed package of elements to work with, the designer utilizes experience working with a variety of elements to recommend those that may be most effective in achieving the stated objectives. On the other end, with an interest in providing valuable design for the
user, the designer will move beyond his or her own personal opinions and training to consider the desires of the user.

The industrial designer, for example, may internally debate the appropriate material or ergonomics for an object to be shaped in addition to researching the audience and intended use of the object. Instead of crafting an object in isolation, using only skill and experience as a guide, the designer is now involved in determining appropriate design procedures to maximize the potential of this work. Similarly, the graphic designer that finds latitude to consider both ends of his design tasks, studies the audience for which the work is intended. He or she begins to maximize accessibility to the document. Instead of referencing personal opinions on the effectiveness of a certain typography, there is now a more appropriate response to consider. Figure 3 illustrates this widening interest of the second and third order designer.

![Diagram](image)

Figure 3 is a revised illustration from Golsby-Smith, “Fourth Order Design: A Practical Perspective,” 7.
This movement represents the first step of the designer outside the first and second order of design. He or she is now involved in the process that surrounds the creation of a solution to a specific issue. This defines involvement in the third order. This involvement will increase from influencing the elements with which the designer works, to influencing the larger processes by which the designer receives these elements. It is important to note that these processes in which the designer may become involved are not random, but move through a series of events that begin with the client’s identification of a purpose. Depending on the objectives that shape the effort, there may be decisions about: the form of the product; the production methods of the product; multiple characteristics of the product itself; inclusion of significant individuals in the process; and the integration of the product or solution.

When the designer affects the once static concept and content, he or she now influences the processes by which the problem is framed and the design is executed. Once involved, the designer has moved outside management of documents and products, typography and materials. This widened role of the designer now includes the management of processes.

Naturally, this increases a designer’s value across multiple areas. He or she places a more valuable document or object in the user’s possession, and provides a more valuable service to the client who desires to achieve specific objectives. To varying degrees the designer’s value has moved outwards to both ends. Figure 4 illustrates this movement.
Figure 4 is a revised illustration from Golsby-Smith, “Fourth Order Design: A Practical Perspective,” 8.

With increased involvement comes increased accountability. It is important to note this for two reasons. First, designers have already recognized the potential in accepting this responsibility and many offer third order design services through what is known as strategic design in the advertising field. Strategic designers, for example, might research the role of a business and determine steps to increase influence on current or potential customers. The result of this research might be a designed process directing first or second order design activities. The recognition of the third order designer is a significant step in identifying the position and potential of the fourth order designer. Second, increased accountability is only that. Although the designer plays a more prominent role in improving the process by which decisions are made and solutions are created, the client maintains ultimate responsibility. The decision is theirs. Otherwise, the designer becomes client.
Finally, as design thinking has broadened the designer’s involvement in the decision making process, it has not eliminated his or her role in the first and second order of design. Indeed, the new efforts do not cancel out previous ones, but highlight their importance.
Buchanan’s theory of fourth order design grows out of an expanding role of the designer in the third order, and the eventual inability of the third order designer to address certain issues by way of the processes surrounding a client’s objectives. Up to this point, the designer uses experience in the first and second order, in addition to involvement with the client and user, to make the processes that bring the objectives to a realized solution for the user more efficient and effective. When the result of this effort is unsatisfactory, the natural tendency is to reassess the process. Third order design has in the past taken shape in what Buchanan refers to as process reengineering. This is a kind of quality control effort to identify areas of improvement. However, despite this reengineering effort and contributions of the third order designer, a shift of resources or adjustment of the process in any number of directions is ultimately not enough to return favor to the end result.

In such a scenario, a questioning of the purpose of process arises. Considering a transient target audience and evolving culture, the objectives that drive a process forward should also be dynamic. If the solution is unfavorable to a user after third order

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revisions, there is a good chance the audience has shifted its preferences or expectations for a result.

Traditionally, determining purpose is the domain of the client. The business in which the designer is employed exists through a client’s effort to address a problem or fulfill a desire expressed by a user or audience. It is the client’s responsibility to form the process and determine the concept. However, I have described the designer’s ability to improve the client’s effort through the application of third order, integrative design thinking. Through continued application of design thinking as problems arise, the designer’s domain may widen to include the efforts of the client in establishing a proper purpose.

If third order design is a consideration of the processes surrounding a task, the fourth order is a study of the purposes driving these processes. There are two major questions surrounding the designer’s involvement in this fourth order. First, what is the criteria for determining the value of a stated purpose? Second, how is the designer capable of contributing to this evaluation?

Buchanan addresses the problem of identifying the appropriate criteria for the questioning of purpose in his paper, “Branzi’s Dilemma.” This work is a response to the attempt by Andrea Branzi in his paper, “We Are the Primitives,”7 to find a way forward

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for the practice of design. As the modernist movement drew to a close at the end of the 20th century, Branzi realized that its overarching purpose of continual improvement of the human condition through progress in multiple disciplines, including art, design, and technology, no longer worked. He lamented, “(p)rogress no longer seems to be valued; instead, the unexpected is valued.” Even as early as 1960, a general questioning of purpose was being raised. In “Dilemmas in a General Theory of Planning,” authors Rittel and Webber note that

(m)en in a wide array of fields were prompted to redefine the systems they dealt with in the syntax of verbs rather than nouns—to ask “What do the systems do?” rather than “What are they made of?”—and then to ask the most difficult question of all “What should these systems do?”

The emerging consensus was not only that design was missing a compass, but that these were valid questions for the designer to ask.

In “Branzi’s Dilemma,” Buchanan addresses the issue of reorienting the design profession in light of modernism’s now-unacceptable ideals. The primary question in this dilemma, especially concerning fourth order design, is how are we to answer the question of why, when performing a task? What must we consider? Is the answer yes or no? Good or bad? Right or wrong? Under modernist ideals, the question was one

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8 Branzi, “We Are the Primitives,” 37.

of progress, and the answer was in the affirmative or the negative. Moving forward, Buchanan simply suggests that an answer requires a study of the activities that require similar efforts, and inquiry into how well the results of these efforts are integrated by the user. The key is that the success of the integration reflects the desires of the user. These users make up vibrant cultures, which integrate processes, products, and consequences. Through observing this integration, a determination can be made as to the appropriateness of such efforts. We will further discuss the validity of using culture to identify appropriate purposes in the next section of this paper.

Concerning the second question of the designer’s capabilities, we have already discussed a solid rationale for the designer’s involvement in each order of design and, indeed, the need for an application of sound design thinking is called for in the fourth order. The integrative capacities of design thinking are well suited to combine a variety of elements in designing artifacts in the first and second order, and the people, systems, schedules, and a variety of other variables in the third order. Integration of second order elements and third order processes mean that the designer is also equipped to define his or her role and duty throughout the process. However, in spite of this ability, the designer is still human. There is always a danger in assigning responsibility for defining the purpose of any effort, regardless of qualifications or the scope of a job. The designer is not exempt from this and I will discuss the responsibility that surrounds his or her involvement in fourth order design later in this paper.
In “Branzi’s Dilemma,” Buchanan wrestles with the task of defining an appropriate purpose for design efforts. If the fourth order designer is to identify a worthwhile objective, what criteria shapes this identification? Is there a higher moral purpose to adhere to? Should we work towards a specific social objective? Should we be defenders of individual freedom?

To answer this question, we must define at whom these design efforts are directed. And through our discussion of the varying orders of design, we’ve discovered that design thinking is present in most, if not all, activities that comprise organized efforts, or what Buchanan would simply call, culture. It was noted in the Preface of this paper, that I would rely on a general understanding of design in an economic sense, but that a variety of conditions could be inferred to move design thinking beyond this traditional application. Golsby-Smith, like Buchanan, identifies culture as the “widest domain of discussion around a task.”¹⁰ This obviously creates a large pool of activities to consider when trying to form a new direction for design. However, when we consider the impact of design thinking, any organized effort or any culture, local or universal, stands out as the impetus for design and the direct recipient of its efforts. Issues that require design thinking in the various orders arise through cultural interaction and are addressed through cultural integration. Culture creates design and determines its appropriateness.

Of course, the impact of design depends on the cultural response and integration of sound design thinking. As a universal community, we can identify one culture. As a national community, we may identify a smaller separate culture. Or we can specify a variety of separate cultures that make up one national culture. The scope of culture to be considered is defined by interaction with the design result. So, once we are able to identify culture, how should we define it so that we can consider its role in our design task? Responding to this need, Buchanan defines culture as a verb, not a noun.

(C)ulture is not a state, expressed in an ideology or body of doctrines. Rather it is an activity. Culture is the activity of ordering, disordering, and reordering in the search for understanding and for values which guide action. Culture is the search for principles in the everyday engagements of life as well as in the special human engagements of science, art, politics, and design. In short, culture is what we do when we are alone or when we are together in such a pursuit.¹¹

In the first three orders, design is charged with tasks of ordering, disordering, and reordering words and images, objects and materials, and processes and actions. The designer’s role in the fourth order is to use this same skill set to order, disorder, and reorder the values and beliefs expressed by an organic culture that are relevant to an organized effort. These values and beliefs provide insight into the appropriateness of either the objective proposed by a client, or revisions to this objective proposed by the designer. Sound design thinking in the fourth order considers a diverse array of cultural values or beliefs to determine how appropriate an objective might be. Buchanan notes,

We need diversity and alternative perspectives to keep alive the ongoing inquiry into ordering, disordering, and reordering that is the central enterprise of human culture. We need the diversity of many personal visions to avoid entrapment in narrow thinking.¹²

In addition to identifying the potential of design thinking in ordering, disordering, and reordering, we are also building a set of qualifications or expectations for the designer. Let’s discuss how the designer is qualified to meet these expectations.

Integration

"Without integrative disciplines of understanding, communication, and action, there is little hope of sensibly extending knowledge beyond the library or laboratory in order to serve the purpose of enriching human life."¹³

We’ve reached the point in our study of design thinking where we’ve recognized that the designer has much to offer in determining the values and direction of a process surrounding any effort. We’ve brought the designer to the crossroads of culture and asked him or her to identify the path forward. We’ve provided the opportunity to question the actions we take and have requested reasonable answers.

How is the designer suited to assume this responsibility? Through our discussion of the four orders of design, we’ve identified a skill set that logically leads the designer to this position. But there is also a much greater impetus for the involvement of a designer or

sound design thinking; there is a cultural need for design, beyond its problem-solving capabilities.

In his paper, “Wicked Problems in Design Thinking,” Buchanan analyzes the current status of our liberal arts and the trend toward specialization in many fields. If we were to consider the liberal arts as represented by slices of a circle, we can characterize our advancement in knowledge as making these slices increasingly specific and finite. There are now multiple slices within a single, traditionally-recognized liberal art. Subsequently, instead of the liberal arts providing a broad and integrated understanding of human experience, its fragmentation has contributed to a lost “connection with each other and with the common problems and matters of daily life from which they select aspects for precise methodological analysis.”¹⁴

This lost connection has raised the design discipline from its infancy in the early twentieth century to an integrative skill set, required and identifiable in many professional areas today. Design serves to bring together the knowledge and results of these specializations to make them useful to a complex culture requiring actionable information, free from the specialized context from which it originates. Design thinking is concerned with connecting and integrating “useful knowledge from the arts and sciences alike, but in ways that are suited to the problems and purposes of the present.”¹⁵

Thus, the goal for the designer remains integration. From arranging type and image in the first order of design to working with a diverse culture that cultivates distinct bodies of knowledge and ideologies in the fourth order, the designer is utilizing a skill set sharpened through experience in multiple orders. Design thinking is not the picking of a preference or the gathering of a consensus, it is the use of an integrative ability to reach “an agreement that this or that is what shall be done today, so that ideological disagreement may be suspended and production move forward with the support of all of those involved in the planning process.”¹⁶

Responsibility

When the designer is asked to contribute his or her design skills to a task such as ordering, disordering, and reordering cultural values to determine appropriate objectives, they accept a meaningful responsibility. However, it is not only the designer, as we have been discussing, that utilizes the skill of design thinking in these efforts. Herbert Simon, the highly accomplished psychologist, economist, and philosopher, spent much of his professional career researching human decision-making and problem-solving processes. In his influential 1969 book, The Sciences of the Artificial, Simon recognizes the issues faced by the designer as the same faced by many others in similar circumstance. His characterization of design thinking broadens our understanding of this skill.

¹⁶ Buchanan, “Branzi’s Dilemma: Design in Contemporary Culture,” 19.
Everyone designs who devises courses of action aimed at changing existing situations into preferred ones. The intellectual activity that produces material artifacts is no different fundamentally from the one that prescribes remedies for a sick patient or the one that devises a new sales plan for a company or a social welfare policy for a state.¹⁷

Under this characterization, all individuals contribute design solutions to culture and rely on design thinking, likely, multiple times a day. Each individual has a “client” and an “objective.” So, how do we form objectives, determine processes, and define results? In essence, how sound is our design thinking?

Problems in design thinking arise when the designer incorrectly interprets his or her role. When asking the designer to apply the skill of design thinking to a problem, we are not looking for someone to play the role of philosopher or theologian, to pursue higher questions of meaning.¹⁸ We are asking that the designer take into account the cultural variables included in the decision they face and integrate them appropriately. Indeed “design increasingly seeks to include in its process of deliberation and decision-making all those who will be affected by a new product.”¹⁹ The goal of design thinking is that the solutions are integrated into useful and viable cultural patterns. Otherwise they are useless. If design solutions are not appropriate for the task, they will not be adopted by participants and operate as a fragmented result.

There are obvious impediments to sound design thinking. What happens when a
designer is biased or selfish, wed to one ideology over another? Buchanan notes,
“(h)uman beings have an unsurpassed ability to avoid questioning themselves and
objectively examining the consequences of their beliefs and actions on others.”²⁰
Appropriately, this behavior is in stark contrast to the characteristics that we used to
define culture. As we noted earlier, culture is an activity, constantly reordering itself.
Successful design thinking recognizes the importance of

responsible discussion, deliberation, and collaborative decision-making on
critical issues of action, where participants recognize that there may be some
truth in the arguments, beliefs, and perceptions of their opposing colleagues.²¹

Ultimately, we all possess the skill for sound design thinking and have a responsibility to
pursue as much. We are all a part of the culture that creates a need for sound design in
four distinct orders. It is the individual’s responsibility to suspend allegiance to specific
ideology and place personal interests in the context of culture as a whole.

Identity and moral purpose come from considering our relations with others,
from learning to perceive what is true and valuable when the world is regarded
from other perspectives. The pluralism of individual perspectives is essential
to ensure that the exploration does not become entrapped in a single ideology.
Design is the most vivid domain for this cultural activity in the contemporary
world, because it deals with concrete and objective results whose consequences
affect us all.²²

A CRITIQUE

I was introduced to Buchanan’s theory on the four orders of design during research for my first semester project at Notre Dame. It challenged the concept of my work and has influenced each semester’s effort since then.

That first semester work was concerned with what I perceived to be failures in the design of our federal income tax system on multiple levels, or you could say, in multiple orders. Through studying the history and structure of our current system, I identified five distinct failures. These failures could be summarized as unnecessary complexity, internal corruption, external corruption, inefficient management, and resource abuse.

The two-dimensional design effort to communicate these failures took shape in an three-dimensional installation that included five 8’ x 1’ banners. These banners, hanging from the ceiling, formed a towering wall of imagery that could be experienced from both sides. Figure 5 shows the gallery-facing side of these banners and Figures 6 and 7 show the street-facing side. Upon entering the exhibit, the viewer would initially identify the photography associated with each banner and the overlay of large tax forms. The intention is to briefly and quickly present visual elements that allow the
viewer to identify the subject matter of the installation. Upon closer inspection, the
recognizable photography from across the room, becomes less recognizable. The
images are intentionally blurred and compete with the now large, overlaid tax forms
that begin to create abstract patterns on the surface. This composition is intended to be
representational of the system itself; clear from a distance but convoluted and abstract
upon closer inspection.

Additionally, the banners were hung in front of a large window that faced the downtown
streets of South Bend. From outside the gallery, the combined view of the banners act as
an invitation to the passer-by to interact with the work, and present an general attitude of
project. Figure 7 shows this outdoor view. The message of the work was complete when
the viewer interacted with each side of the installation, in any order, and from multiple
distances. Although the size and layout of the installation was intended to encourage an
emotional response from the viewer, the work stimulated an intellectual consideration of
how our federal income tax system is structured. The shortcomings that represent design
failures present design as an activity beyond the two- and three-dimensional.

The books on our federal income tax system are huge. The IRS tax code, regulation,
and rulings that further define the legal limits of the system, number some 54,846
pages in length.²³ This number increases with each meeting of Congress. Organizations

²³ Chris Edwards, “10 Outrageous Facts About the Income Tax,” Cato Institute, April 15, 2003,

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successfully lobby congressmen and women to grant special privileges under the tax code that ultimately erode the expressed purpose of our graduated progressive tax structure. See figure 8 for an image of this banner.

Members of Congress responsible for legislat ing the tax code routinely receive millions of dollars from lobbyists who wish to gain from special tax exemptions.²⁴ When the individuals whom we trust with fair enactment of our laws do not consider the individuals affected by their decisions, or how their decisions undermine the purpose of the system, the system is poorly designed. See figure 9 for an image of this banner.

In addition to influence from within the system, the current tax structure supports large private organizations who depend entirely on the complexity of our tax law. H&R Block, a major tax preparator service, has a market value of 10.64 billion dollars.²⁵ This kind of dependence on a unnecessarily complex law encourages support for it to remain unnecessarily so. See figure 10 for an image of this banner.

It is estimated that 1 out of 2 calls to the IRS for clarification on the code that they oversee receive an inaccurate response.²⁶ The process for tax-paying citizens to complete their tax returns is made all the more unsound when there is such a large

return of erroneous information. See figure 11 for an image of this banner.

Finally, our energy resources are heavily burdened when we rely on the poor design that frames our federal income tax policy. It is estimated that nearly 300,000 trees must be cut down every year to supply the 8 billion pieces of paper needed to file the country’s income taxes.²⁷ With our current technological capabilities, this seems an unnecessary strain on an environment that we are obligated to sustain. See figure 12 for an image of this banner.

From maintaining the objectives of the federal income tax system, to improving the efficiency of its processes, to the specifications of the physical supporting materials, our federal income tax system can be accurately assessed as very poorly designed. In spite of what many may consider positive aspects of our current system, the need for a refined process is clear. Additionally, I would argue the need for a repositioning of purposes. The debate as to what this purpose should be is an ongoing topic in our cultural sphere. Those who are responsible for enacting tax law would do well to take note of this dialogue, instead of perpetuating a design that traces a tortuous path to a questionable objective.

| 1a | Sport fishing equipment |
| 1b | Arrow components |
| 4  | Gas guzzler tax (Attach Form 6197) |
| 6b | Highway-type tires (see instructions) |
|    | Total: Add all amounts in Part I. Complete Schedule C. |

**Part II**

5c Our time wasted and money spent by someone else. Our forests depleted to feed bureaucrats. Our representatives greased to provide the advantage to lobbyists.

**Part III**

6. Claims (Complete Schedule C). Opposite is made for the quarter.
Figure 7
A THESIS

“We must learn to look at our objectives as critically and as professionally as we look at our models and our other inputs.”²⁸

Entering my final year of graduate study at Notre Dame, I was still influenced by the efforts from my first. I realized using the fourth order theory to assess and critique various design efforts opens entirely new areas for analysis. An analysis of design failure in our federal income tax system is something that can be recognized and appreciated by many. For my final project however, I decided to work on a topic that was much more nuanced and required a much closer study to fully realize how successfully it implemented sound design thinking.

The topic of global warming has been a front-page issue in our culture for years. It is an increasingly polarizing issue, with many believing that we face a very simple choice. Individuals on both sides, creating a “cacophony of screaming,”²⁹ have framed the issue much like a client would for any project. One group believes global warming is a man-made problem and requires a man-made solution. Another group believes that no


problem exists in the face of large natural fluctuations of climate behavior. I believe the identification of a purpose on this issue, by each group, leaves much to be desired.

If we consider the purpose surrounding each characterization of the issue, one is to stop man-made global warming and the other is to simply ignore the phenomenon altogether. Each requires an understanding of climate that is undoubtedly beyond our current capabilities. To stop man-made global warming, we must quantify what exactly warming is. What amount of warming is too much? How do all the climatic variables react to warming and how does that translate into limiting man’s influence? On the other hand, to advocate inaction, is to propose that Earth’s 6.5 billion inhabitants have no influence on any of the variables that determine climate.

Despite this popular and polarizing framing of the issue, there exists a tremendous body of research concerning climate change that speaks to a different approach. In my investigation of the topic, I was naturally led to familiarize myself with the state of this research. What I found is altogether not surprising. However, it is eye-opening in light of the current debate.

One of the largest variables of current climate research is the unknown. This, again, is not extraordinary, considering we are dealing with a highly complex, coupled, nonlinear, chaotic system. There are occasional statements of certainty about climatic conditions, but they are counterbalanced by refutations of whatever certainty may have been held.
This is the nature of scientific study. Theories are proposed and until proven to be correct, or incorrect, they remain theories. They are educated guesses on the conditions surrounding a specific topic, so to speak. The problem with our popular culture’s approach to global warming is that we remain fixated on addressing the first, second and third order issues. Our attention should be focused instead on the fourth order. My effort to bring the fourth order to the forefront in our consideration of climate change has resulted in another installation effort similar to my first semester at Notre Dame. This installation has three parts. First is a recognition of the problem as it is commonly understood. Simply, one group believes global warming is man-made, another believes it is natural. These two positions are represented by popular media headlines that make up two separate prints, shown in figures 13 and 14. These prints are placed on opposite sides of a wall located in the middle of the installation, shown in figures 15 and 16. The second part is an offering of worthwhile research on the topic of climate change. The audience is encouraged to pick up an abstract summarizing a notable research effort at the start of the exhibit. These abstracts are located at the front of the exhibit, pictured in figure 17. These two parts come together in the third, where the viewers are encouraged to simply identify which position is supported by the abstract they have in hand.

It is in this action that the fourth order is suggested. The research that is presented to the audience is intentionally altered to clearly support one of the polarizing characterizations of global warming. Large portions of the abstracts are marked out,
leaving only what constitute definitive statements. Figure 18 is an example of one of these abstracts. In essence, this editing results in exactly the same message that we receive from major media outlets. The viewer is now confronted with all that is not considered. Can we appropriately understand the problem of global warming if we intentionally ignore large portions of the research? The audience must consider this question as they are asked to place the abstract they have in hand in one of three locations at the back wall of the exhibit, shown in figures 19, 20, 21, and collectively in 22. One location represents the position that global warming is man-made, one represents that it is natural, and the third represents the position that neither is an accurate setting of the problem.
Figure 13
Figure 14
Figure 18
CONCLUSION

Before coming to Notre Dame, I was happy working as a graphic designer, solely in the first order. After sharpening my skills in the two-dimensional however, I felt the natural tension that Buchanan describes as drawing the designer into situations with increased value and participation, including a heightened use of the skill of design thinking. The opportunity to truly expand my design skills never clearly materialized. I imagine it rarely does for most first or second order designers. In fact I would wager that the knowledge of a design practice beyond these two orders is something that is rarely considered. It was not something that I was aware of at the time, but I did feel like the practice of design had something more to offer. This curiosity and desire to explore the boundaries of design is what drove me to graduate school, and a confirmation of my suspicion that design tasks can transcend the traditionally defined disciplines to contribute clarity in situations of great complexity.

The integrative skill of design thinking that we have used to identify the role of design in multiple contexts has no boundaries of application. Indeed, it is a skill that has existed, and will continue to exist, in countless efforts across multiple professions. We would do well to confirm its widening domain and set as a goal, based on the priorities and principles set forth in this paper, sound design thinking in the fourth order.
APPENDIX

Figure 8
IRS TAX CODE, REGULATION AND RULINGS TOTAL
54,846 PAGES IN LENGTH. INCLUDE THE ADDITIONAL
RESOURCES NECESSARY TO UNDERSTAND OUR
CURRENT TAX STRUCTURE, AND YOU HAVE ONE
IMPRESSIVE LIBRARY.

Figure 9
MEMBERS OF THE SENATE TAX-WRITING COMMITTEE
RECEIVED $13,478,792 IN CONTRIBUTIONS DURING THE
6-YEAR SENATE CYCLE ENDING IN 2000.
Figure 10

H&R BLOCK HAS A MARKET VALUE OF **10.64 BILLION** DOLLARS, AND A SERIOUS INVESTMENT IN THE STATUS QUO.

Figure 11

**47%** OF CALLERS TO THE IRS RECEIVE INACCURATE INFORMATION.

Figure 12

**293,760** TREES MUST BE CUT DOWN EVERY YEAR TO SUPPLY THE 8 BILLION PAGES OF PAPER NEEDED FOR FILING THE COUNTRY’S INCOME TAXES.
The global warming debate is undoubtedly polarizing. The previous panels present headlines from various media sources reflecting the wedge that divides opinion on this issue. One side of the debate asserts that global warming is man-made and its consequences are primarily negative. This group also believes restricting CO₂ emissions is the best way to avoid the repercussions of a warming planet. The other side of the debate counters that global warming is a natural occurrence and its effects are not entirely clear. This group believes restriction of CO₂ emissions will have a negligible impact on climate behavior.

Upon entering this exhibit, you were encouraged to pick up a peer-reviewed abstract representing scientific study on this issue. As a discriminating viewer, can you identify
which position is supported by the abstract you have in hand? Hang your abstract on
the left if you believe it indicates an unmistakable human influence and/or clear support
for CO₂ restriction. Hang your abstract on the right if you believe it suggests large natu-
ral fluctuations of climate and/or alternative solutions to restricting CO₂. If you think
your abstract is not so clearly categorized, hang it in the middle.
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