How to Develop Basic Research in Communication Design

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1. Introduction:

Theory and research are controversial in communication design. Communication designers are largely unfamiliar with research and with basic research in particular. First, they see their work as quintessentially practical (Buchanan, 1999, p.8). Second, their field lacks a self-definition that can support and integrate research. The resulting fragmentary and syncretic knowledge does not inspire confidence in its value.

This is a tendency in design that communication design exhibits to a high degree. Communication design education cultivates it by operating within fine art milieus, using project based pedagogies reminiscent of the atelier tradition, and evaluating work on formal aspects without linking them to what drives the actual meanings communicated; this connection is often taken as ineffable. Communication design curricula rarely include any formal study of the functional foundations of communication. As a result, communication design operates according to acquired practices rather than explicit knowledge. Communication designers largely lack insight into how they accomplish their ends. Given that most design educators are products of that education, it is not surprising that this tendency persists.

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The truth is that basic research can inform and transform practice by revealing essential, constitutive aspects that are hidden to practice alone, and by building foundations for the applied research that provides directly useful knowledge to practitioners. Design practitioners need not engage in basic research any more than practicing medical doctors need to conduct their own drug studies. But if designers are to develop their knowledge and expertise, the field needs to generate research and connect it to practice.

1.3 Research and Problems with the Field of Design:

Applied research is aimed at specific situations that practitioners face. Applied research can sometimes be related to whole classes of situations or enable one to make broader inferences about the field, but that is not its purpose or its area of competence. Basic research focuses on the field itself. It defines and studies the field.

Basic research may yield directly useful results, but those are not its essential purpose or competence. Its competence and role are to enlighten the field by developing our understanding of it. It grounds and supports applied research by framing methods and findings in an integrated structure of knowledge, which is explicitly stated and available for critique.

Fields with established research traditions have ontologies: models that define their domains as objects of study. They also have epistemologies that define what knowledge is, what can be known, and how it can be researched and learned in their respective domains. Theory construction and ongoing research are hallmarks of living disciplines; theory embodies the discipline's self-knowledge and its models, while ongoing research comprises its power to develop and adapt models for its field.

While basic research defines and clarifies a field, the lack of a clear definition of a field can also make that research difficult. Design theorists have been debating the nature of design for decades without developing a consensus that can be well articulated and researched. The result has been described as "'a floating network of chunks of ideas', without fixed epistemological core, acting in the interface region between shifting reference spheres: the contextual and the artefactual." (Jonas, 2003, p. 2).

Theorists have reacted to their dilemma by asserting the uniqueness of design in various ways. Clive Dilnot, for example states that design cannot be accommodated satisfactorily within either the model of the sciences/technological sciences or within the humanities/social sciences; design is a third form of praxis with its own models of doing and knowing. (Dilnot, 1999, p. 8). Others argue that the practical orientation of design sets it apart. Nigel Cross summed this up in several discrete points: designers tackle "ill-defined problems", "[t]heir mode of problem-solving is 'solution focused'", "[t]heir mode of thinking is constructive", and "[t]hey use 'codes' that translate abstract requirements into concrete objects." (Cross, 1982, p. 226).

Notions that design is a category in itself are also disputed: "In summary, design does not make use of a special kind of reasoning,"(Coyne & Snodgrass, 1991, p. 129), and "It is no more necessary to describe design thinking as mysterious than it is to make the same claims of any other manifestations of expertise." (Coyne & Snodgrass, 1991, p. 125).

By definition, every field has characteristics that differentiate it from others, so design is not unique in having its own challenges. Designers are not alone in seeking solutions, thinking constructively, translating concepts into specific outcomes or working with ill-defined problems. Defining ill-defined problems and resolving them places design in the mainstream of research inquiry.

Theorists have not found an adequate understanding of design, but the problems and observations they address—particularly that design does not fit entirely within either sciences or humanities (alone)—are important. They lead to the inference that the difficulties of defining design may reflect its kinships to both sciences and humanities.

Sciences and humanities are merely competing cultures (Cornelius & St. Vincent, 1964). They represent deeply divergent (Miller 1978, pp. 11-19.) and contradictory ways of thinking: causal vs. purposeful; constructive versus interpretive. Sciences and technologies direct us outward, toward the universe and toward explaining and predicting (Quine, 1951, p. 41) to manipulate and competently construct things. Scientific terms rely on designating observable objects of the external world, and the language of sciences is descriptive of those, so called "extensional" objects and their interactions.

Humanities, on the other hand, direct us toward culture, ideas, ethics and critical self-understanding: toward questioning and imagining alternative interpretations. Humanities rely on terms that designate "intensional" objects: objects that exist only in thought. We can point to a star, but we cannot point to an anger. We can only point to physical behaviors that we can come to interpret as angry, by looking at behavioral cues such as facial expression, gesture, etc. Apprehending intensional objects requires leaps of thought from observable behaviors or objects to concepts that are applied as interpretations of those observables. In other words, intensional objects are concepts applied to things, not the things themselves. In common usage we are discussing distinctions between "abstract" and "concrete" objects, and their use in "figurative"/"interpretive" and "descriptive" language.

In science, cause is the operative relation; its equivalent in humanities is interpretation. Cause originates in the environment, while interpretation originates in the person. Cause effect relationships are determinate (Heise, 1975, pp. 11-12), while the interpreting mind intervenes, to break that determinacy. Mind can, in a sense, reverse time as the projection of future outcomes can alter present behavior.

Each of these two paradigms has its place and its limits. Scientific approaches are unsatisfying when directed toward the human self. They reduce conscious life to physical patterns in the brain. (Robinson, 2004, 158), (Miller, 1979, p. 11). The converse, among some humanists, has been to treat science and scientific knowledge as cultural or subjective and to "hypostatize" intensional objects: to treat them as if they were extensional, as when the viewer is said to have "a dialog" with a painting.

Design's major ambiguities come from straddling these divergent ways of thinking. Designers wish to efficiently construct physical artifacts that predictably and reliably cause persons to make specific interpretations. The fact that designing entails combining scientific and humanist perspectives helps explain the difficulties designers have in defining their field. Richard Buchanan (Buchanan, 2001), and others have advocated versions of a third position: that we make sense of design by viewing it from the pragmatist, hermeneutic or phenomenological perspectives that themselves straddle sciences and humanities. For communication design, at least, this sort of position has much to recommend it.

Defining Communication Design and Research Guidelines:
These considerations indicate the difficulties of design theory but do not provide a solution. To take a step towards building a theory in communication design, we must first address the question of how to approach theory building.

Middle twentieth century sociology exhibited difficulties we now see in design. Sociologist Robert Merton argued that the so called "grand theories" of his day were symptomatic of his field's immaturity, reflecting "the gap between the practical problems assigned ... and the state of ... accumulated knowledge and skills" (Merton, 1968, p.50). To close the gap, Merton proposed "theories of the middle range"… "between the "minor" but unavoidable working hypotheses that evolve in abundance during day-to-day research and the all-inclusive systematic efforts to develop a unified theory..." Middle range theories "involve abstractions, of course, but they are close enough to observed data to be incorporated in propositions that permit empirical testing." (Merton, 1968, pp. 39-40).

This strategy does not abandon foundational theoretical problems like those facing design theory. It holds high level theory in abeyance to do research at sustainable theoretical levels. The foundational questions can be approached later in light of what will be learned in the interim.

2   Building Research in Nine Steps
To build a theory we can define and follow the major steps leading from a general question to a specific empirical research project. The steps presented here are not the only ones possible, but they are valid choices: meaningful and representative of the process. I developed them and tested conducting my basic research project, thus they are proved to work. These nine steps followed here are:

1. Develop a problem statement: a general question or observation that will motivate the inquiry.
2. Define an approach to study according to theoretical criteria- in this case middle range theory.
3. Define and make a theoretical model of communication and communication design.
4. Define a specific research question: the general question restated in light of the definitions.
5. Operationalize the research question; transform its terms from interpretive concepts that refer to interpretations of objects/events into terms that point to the concrete objects/events themselves. In operationalized (empirical) research, intensional terms are rewritten as extensional ones.
6. Construct hypotheses or claims that can be tested as measures of the research question.
7. Design the experiment.
8. Execute the experiment.
9. Present findings.

Let us now follow these steps.

Step 1: Problem Statement
The research project used here as a case study begins with the observation that designers lack insight into how they construct communications, relying on conventions of style and intuition. The goal of the research is to reveal the operative design mechanisms and relate them to how communications are understood.

Step 2: Middle Range Research: Working Specifications
         Applying Merton's strategy, we can approach communication design as an activity to label and study,

with the goal of building a model of that activity for research. The resulting research should make it possible to determine whether the theoretical model is defensible and useful; if the results are incoherent the theory is likely incongruent with the reality it seeks to capture/explain. Here are guidelines for developing research:

1. Define a specific design activity or phenomenon to study.
    a. The definition must be clear and consistent, and it must delimit the domain of study.
    b. The definition must reasonably represent the activity to be studied as it is experienced.
    c. The activity as defined must be an intelligible, integral whole: reasonable to study as a discrete unit.
    d. Its theoretical significance must be made explicit.

2. Develop an intelligible theory of the phenomenon that can support research.
    a. The theory must be theoretically credible and coherent, both internally and with respect to its target phenomenon.
    b. The theory must be able to yield hypotheses that can be tested and measured.
    c. The critical concepts used in the theory must be critically examined and reformulated as needed (Vernacular concepts are often found defective on investigation, and concepts cannot be simply declared or appropriated as axioms).
    d. Any theoretical model of human behavior, must be consistent with human capabilities. It is not enough to say that people act "as if" they are doing something. It must be demonstrated that they actually do or can do it. For example, Noam Chomsky's model of how natural language can be parsed for understanding is far too complicated to be done in the head. It fails this requirement.

Step 3: Definitions of Communication and Communication Design
Based on these criteria, I propose the following working definitions of communication and communication design:

1. Communication is an activity that induces in the mind of the receiver (viewer, listener, user, etc.), a specific thought or 'object for consciousness' called the "content" or "meaning": an awareness of the content, and the sense of 'knowing' that it has successfully been grasped ("I get it.").

2. (As an outcome): The communication (aka the design) is the physical artifact (writing, speech, diagram, video game, etc.) that induces content in the receiver. The content induced in the receiver is defined as the 'interpretation' that is constructed by the receiver. By definition, the receiver's interpretation is what has actually been communicated: not what was intended and not what an expert might present as correct.

3. Communication design is an activity that focuses on the arrangement of physical attributes of communications. Its goal is to induce in the receiver a specific content by manipulating the spatial and temporal organization of the communication. Designers define media and select and arrange content.

Core Assertions of this theoretical model of communication design are as follows:

1.   Communication is the primary activity of communication design, and inducing a specific interpretation in the receiver is its primary objective.
   a. The content of the communication is the receiver's interpretation of it, the   "object for consciousness" that the receiver apprehends.
   b. Interpreting is the receiver's attempt to make sense of what has been presented.
   c. Interpretation is neither directly caused nor freely chosen by the receiver. It is "induced" by the communication, which prompts and guides the receiver to make a specific interpretation.
   d. Interpretation does not imply credulity or persuasion. It is merely a grasp of what was presented.
   e.   Experiencing the sense of knowing is a necessary step in interpreting. With that sense, the receiver stops interpreting and commits to an interpretation as adequate or correct.
   f.   The processes and criteria by which the receiver comes to his or her interpretation are primary. Beliefs and evaluations are of the things already apprehended.

2.   Communication design focuses on the communication as an organization in time and space.
   a.   The communication designer decides how the communication presents its contents.
   b. Design induces interpretation by manipulating physical attributes that are not perceived as meaningful in themselves, but which interact with the explicitly meaningful contents.

Step 3.1: Analyzing Our New Conceptual Framework

This model combines scientific and humanist aspects in a division of labor that enables them to coexist, both independently and in interaction. In this division of labor, the theory of meaning belongs to a humanist perspective, while the methods by which the various physical aspects of a communication affect interpretation are treated in a scientific way.

On the side of humanism, knowledge is socially constructed and communication is the method by which knowledge is constructed. Interpretation is not a matter of absolute truth; it is experiential or phenomenological: in knowing that we know something. It is the outcome of a process of rhetorical evaluation resulting in the emergence of a (mental) object for consciousness, along with a sensory marker (a sense of knowing) indicating its adequacy. Phenomenological knowing is not inferior to veridical knowing, or separate from it, but prior to it. We cannot determine the truth of something unless we know what we are examining.

On the side of science, design manipulates physical characteristics of communications that have no meaning per se, although they shape the receiver's interpretation. If the goal of design is to induce the same specific interpretations in many different receivers, then we need to account for predictability and uniformity in interpretation, based on physical characteristics.

A model of human cognitive processing in communication provides the operational level of analysis.

The receiver creates interpretations through cognitive processes as a result of his or her interaction with the physical structure of the communication. Cognitive psychology specifies the species wide physiological processes that govern perception, thought, memory and affect. They are hidden from us by their omni-presence, intuitiveness, spontaneity, immediacy, and the self-evidence of their judgments, though, as Bertrand Russell stated, "Self-evidence is a psychological property" (Russell, 1913, p. 40).

Here is an example. At first glance, Figure 1 is a mass of dots. Eventually, one may sense "Aha, there is a person here." If so, "that person" is the object for consciousness comprising the major content of the interpretation. "Aha" is the sense of knowing that marks the achievement of making the interpretation. We have no direct access to our processes of interpretation, but the difficulty in interpreting enables us to sense that there is mental work going on. The philosopher Hegel is said to have asked students if they could see the blackboard, then if they could "see the seeing?" (Deely, 2001, pp. 490-491).

Figure 1: Woman and Foliage

Step 3.2: Defining Communication as an Arrangement of Space and Time: The Anatomy of Communication

The physical structure is the primary contact between a communication and a receiver: the basis upon which all interpretations are made. The communication in its physicality is "a discrete arrangement of contrasts in space and time, which are experienced as discrete elements organized into composite units of meaning. We can define physical arrangement as the anatomy anatomy of communication. The arrangement is an intervening variable that brings the elements into interaction and determines the outcome of that interaction according to its own characteristics. Arrangements have syntactic properties by which elements can be combined to form new composites.

If we were analyzing language alone, perhaps we could appropriate a linguistic theory, but communication design further specializes in the combining of sensory elements—image, sound, video—with

symbolic elements—text, language, into arrangements that form composites which induce emergent, new interpretations.

The rules of the principle of arrangement are outlined as follows:

1. The communication is recognized and interpreted as a unit, separate from its surroundings.
2. The building blocks of the communication are its contrasts in space or time, which can form patterns or structures: a dark line on a white background; a tone rising from silence, etcetera.
3. Elements are the most fundamental units of meaning: images, texts, sound events.
4. Elements are arranged and linked to form a structure, which comprises the physical communication.
5. Arrangements function as independent variables mediating interactions between elements to create the communication's meanings.

This definition isolates communications along dimensions corresponding to experience: space, time, elements, relations, and organization. It makes the structural elements of communications apparent, making it possible to establish the primary dimensions, principles and variables of the communication designer's domain. As a general definition, it can accommodate myriad variables. For example, a patch of visual texture is a contrast of space, with specific properties, related to other elements in its region. Multimedia and web communications in particular are more complex elaborations of the principle of arrangement.

Let us look at examples of the dynamics within the arrangement, and how it determines interpretation of a communication. In figure 2 below, the proximity of the text to the image relates the two elements to each other. The plane accident text cues interpretation of the image (it is what is left of a house), and the image cues interpretation of the text (the plane flew into the house). The resulting content—the plane crashed into the house—goes beyond the interpretation of either alone. There are myriad devices for arrangement. We choose them depending on the desired outcome.

Figure 2: House, Text, house plus text Composite figure

Step 4: Defining A Specific Research Question.

This information makes it possible to further refine and focus the definition of the object of study: "The study of communication design focuses on the temporal and spatial arrangements that structure the interactions of elements to induce apprehension of composite objects with specific interpretations. It seeks to reveal organizational devices and how they work to induce interpretation." This definition is congruent with the actual work of designers. It focuses on construction and the development of competence in the field by aligning design to human interpretive proclivities.

Step 5: Operationalization of The Research Question.

Within this model of study, the next step is to focus on a specific research question: "Does spatial and temporal organization affect interpretation, and if so, how?" To research this question, one must operationalize concepts, define variables, and design experiments to measure the variables.

Operationalization jumps the gap from humanist to scientific paradigms. It rewrites intensional concepts to designate extensional ones so that we can select instances and corresponding hypotheses that can be tested. Because of the leaps between the fundamental concepts, and from interpretive to descriptive language, empirical studies can only provide indicators relating to the core concepts.

With the concepts operationally rewritten, one can develop hypotheses and test them. The research question "Does organization affect interpretation, and if so, how?" cannot be directly answered. What can be done is to define some specific operational proxies for our concepts, propose hypotheses that predict relations between them and test for those relations. We might reject the any or all hypotheses, but we would not expect to definitively "prove" or "disprove" them as such. We would hope for some relations we can use to develop the theory and start mapping the patterns of interactions and effects that might be used within communication design.

Based on cognitive literature and consistent with the analysis of communication design as combining sensory and symbolic elements, I chose elements that crossed cognitive modes: spoken words and video. Not only is the bifurcation of presentation into sensory and symbolic modes typical in design, it corresponds to human reception and processing. The two systems of cognitive processing are most often modeled as independent and complementary processes which are combined at a deeper cognitive level. (Farah, 1989)

With the elements and relationships defined, one needs to address interpretation. In vernacular use, this term has many meanings. I distinguished three interrelated but distinct aspects of reception: identification, comprehension, and evaluation. Put simply, identification states "what it is", comprehension states "what it means", and evaluation states "how I feel about it".

For the purpose of this research, interpretation is defined as "identification": the object for consciousness that is induced. Among the three aspects of reception, identification is primary and externally oriented. It is primary because it designates the objects that we comprehend and evaluate. Its focus is outward, toward objects independent of the receiver/interpreter. (Miller, 1978 p42-55)

We treat identifications as extensional objects: things we can point at, even if that process is entirely in the brain. Identifications are often correct or incorrect. If, driving at night, one misidentifies the curve ahead, it can have disastrous results. This is the interpretive process that we can sense but not examine directly. It is also independent of conscious control; knowing that thunder and lightning are produced as a single event does not enable us to experience them that way. As optical illusions show us, it is also procedural and fallible; if one knows how perception works, one knows how to trick it.

Comprehension and evaluation involve varying amounts of focus away extension, toward intension: meaning and its application. Understandings are interpretations of interpretations: concepts applied to the things we identify. Comprehensions are not necessarily matters of correctness or error. We can analyze and compare our different comprehensions of things/events, often without any of us being wrong. Evaluation is essentially about the self. It is about how we relate the object to our own goals. (MacKinnon, 1994)

This research was focused on interpretation, leaving comprehension and evaluation for future study, so the question was how to operationalize and measure identification. It can be indicated by recall. We remember things we make sense of in the ways we make sense of them. Recall and its patterns of association are strong indicators of identification.

Steps 6–8: From Operational Hypotheses to Conducting Experiments
In original basic research, like the one discussed here, the challenge is to provide a proof that the theoretical model is researchable, and that it can yield credible results. If the results are also useful and enlightening, that is a bonus.

The empirical aspect of the research comprised two studies, one to determine the workability of the cognitive model and one to test a physical variable. (Storkerson, 2006)Both used ten to twelve-second composite movies in which the video tracks showed one action, while the audio track carried one verbal statement. The analogical/semantic relations between elements varied from explicitly related to implicitly related, and finally to unrelated. Analogical/semantic relationships are the meaning linkages that associate elements. Those relations interact with organizations to form composite meanings. For example a movie with text about weather patterns and a video track showing swollen rivers can easily be interpreted because they can be related by "weather", but text about rain has no discernible links to video of a clown eating ice cream. In the former case, the two can be integrated into a composite that makes sense, while in the latter; we would expect them to be unrelated, thus, to not make sense (i.e. be identifiable) as a composite whole.

In the first study, participants were asked if the elements made sense together, how confident they were of their choice, and what the movies were about. In the second study, the same movies were shown, but they were misaligned in time by differences ranging from one to twelve seconds. The test involving time misalignment explored several variables: how much do differing delays alter interpretation, does it matter which mode is delayed, what is the relationship between interpretation and memory. Participants were asked the same questions. Then their recall was tested according to whether they could correctly identify videos and texts that were in the same movie.

Step 9: Research Findings
Detailed accounts of these studies and their results are published elsewhere. Thus, I will focus here on a few findings:
1. There was clear evidence of cognitive function a strong indicator of the interpretation.

2. There was strong evidence that participants were processing movies in the same way.

3. Responses were the same for both genders, ages from 22 years to 70 years, and education from high school to postgraduate.

4. People find it equally easy to rate movies as making sense and not making sense.

5. Recall was much greater for movies that were interpreted as making sense together than those that were interpreted as not making sense.

6. Temporal misalignment of as little as one to two seconds second substantially reduced the rate at which any movie was interpreted as making sense.

7. However, in movies that did not make sense together, temporal misalignment actually improved recall.

8. When participants were asked for their how they linked videos and texts, they almost invariably gave narratives rather than conceptual links.

These studies demonstrated the workability of cognitive processing as a major determinant of interpretation that was consistent across a reasonably broad population. The major hypotheses proved strong, accounting for much of the observed behavior. The research protocol suggests that many other hypotheses can be derived from this study. The results of which may be of direct use to communication designers by providing them with measurable characteristics of communications to manipulate.

Division of Labor

Where does this research belong in respect to division of labor between sciences and humanities? The measurements and results are extensional as they refer to stand-alone objects. As such, they are methods of sciences. Their meaning is an entirely different matter. The fundamental terms (communication, communication design) are intensional. Thus, they belong to the realm of humanities.

It is critical to understand that the epistemology of phenomenological knowing that is proposed as a general model of knowing, encloses all of this research. First, terms such as "identification", "comprehension", "evaluation", "interpretation", and "organization" do not designate or correspond to anything that can be directly perceived as stand-alone objects. They are interpretive tools, so they cannot be reduced to any of their measures. For example, we cannot say that memory is interpretation, only an indicator.

Conclusion

The basic research project presented here was focused on a very specific question, nevertheless, a solid theoretical foundation had to be developed beforehand. Developing the foundation was the greatest challenge in this project. Within disciplines, studies similar to this one make their theoretical models clear with a few references to other published studies, because the frameworks are in place.

The research demonstrates the importance of building a frame for the domain of study, and not adopting a preexisting theoretical frame, scientific, humanist, pragmatist, or any other. Luckily, once a basic theoretical frame is constructed the difficult process is done. A successful theoretical frame can be reused for other studies in the domain.

I have presented this research and its theory of communication and communication design based on cognitive processing as a model for others to use. It offers a theoretical framework, which can yield further studies. As such, it defines communication design as a research discipline that managed to resolve its problems with ill-defined self-identity. Like sociology of the middle twentieth century, it has a capacity to grow and mature into a research discipline with a status as respected as is sociology, or other disciplines for that matter.

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