SPECIAL ISSUE

VISIBLE LANGUAGE 38.2

COLLABORATION USER STUDIES DESIGN METHODS DESIGN RESEARCH

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In late May 2003, an international group of designers and design educators gathered at the Institute of Design, Illinois Institute of Technology to participate in conversations based on the four themes that title this issue. They gathered in a spirit of inquiry and in recognition of the need to develop a stronger sense of a particular community of practice in design – one that values collaboration, user study, methods and research. The reader may detect a sober tone to the essays that are evaluative, reflective and critical by turns. The participants gathered for several reasons, to share experience and possibility within the theme areas; to locate design as a discipline with intellectual and developmental needs; and to locate themselves and their thinking in relation to others.

The conversations were organic and sometimes unpredictable. Faculty at the host institution served as facilitators for the participants. While these faculty author the papers that follow, the content emerged from the conversation and interaction of the participants. Many voices joined the discussion – they are acknowledged at the end of each paper. Some made brief presentations; these too are acknowledged. This was and is a collaborative undertaking with the information presented here serving as feedback and a reminder of the first steps in building a larger network of designers who share disciplinary values and seek to build design knowledge in a more formal way.

Each of the four themes presented here follows its own logic based on the nature of the discussion, its emergent goals and the synthesis of the author/facilitator.

COLLABORATION USER STUDIES
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COLLABORATION

The Collaboration section contains two essays. The first deals with the many levels of interdisciplinary exchange common to contemporary projects. Participants in this conversation were skilled collaborators, team leaders and facilitators for projects on many different scales and in many different contexts. Projects ranged from inter- to multi-disciplinary, inter-institutional and inter-national. All contained issues of cultural difference whether border crossing was disciplinary, institutional or that of countries. Participants brought their reflections on such diverse projects as: agreeing to and changing Canadian government public communications (Alain Rochon); creating a design curriculum for a school in the Emirate of Qatar (John Demao); negotiating challenges between information architects and visual designers (Maria Giuduce); creating a network approach to development of a Design Research Institute (Don Newgren); doing research collaboratively in different countries and across language systems (Patrick Whitney), to mention a few. The conversation concluded with a typology of collaboration variables and a "straw" project tested against these variables. The second article, by Roger Remington, is a more formal case study dissecting problems in inter-institutional collaboration.

USER STUDIES

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User Studies: Finding a Place in Design Practice and Education

Design is feeling its way regarding User Studies and this is expressed in Jay Melican's recap of their two day conversation. In contrast, the social sciences have theory, method and substantial knowledge, yet often its research results are mind-expanding rather than actionable. This is the crux of the problem for design as it increasingly takes on the role to represent the user in the artificial world design mediates. This is an inter-disciplinary arena with terminology and process difficulties that emerge from different cultures, disciplinary status, goals and habits of communication. Difference in goal orientation between design and social science is another significant focus, as translation from user study to design action often necessitates a leap of understanding, or at least a translation into design implications. Results of user studies need to point to design action, consequently the need for a shared context of understanding is paramount. Significantly, angst, among designers working in this area, over the legitimacy of borrowing methods from the social sciences is finally diffused – the essay on Design Research openly discusses methodological inheritance. Other topics that figured in the conversations were: technology related issues, justification for user studies, ethics, the impossibility of isolating user study effects and the problem of demonstrating return-on-investment.

DESIGN METHODS

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Where Are the Design Methodologists?

Reflecting on its early history in the 1960s, the Design Methods essay goes on to describe the enthusiasm and resistance that continue to mark its reception and development. Two common anti-method issues are flagged: method destroys or at least confines creativity and method development is less important than the pragmatic act of doing of design. Chris Conley is careful to define use of the words 'design' and 'method' in the essay. The need for methods in design is presented in relation to other disciplines that worked through similar resistance. Implicit in this argument is the idea that design is less than a discipline, if it cannot describe and defend its processes and knowledge. In the increasingly inter- and multi-disciplinary situations in which designers work, disciplinary coherence becomes a substantial challenge whose attainment brings validation and respect. If all process is idiosyncratic or in a state of flux, what can we count on and what can we build upon? An anatomy of a method is offered in order to tease out methods that exist and areas that are empty and ripe for development.

While Design Research is a relatively new initiative, Keiichi Sato describes two fundamental approaches to it: research to advance a design project – research that is particular and research to develop a general body of knowledge applicable across cases – research that looks for principles or robust patterns and is not dependent on a single case. It is the later form of research that was the focus of discussion. The domain-crossing character of design, together with its lack of specific research inheritance, internally complicates its development. Presented as snapshots, the research cases became the occasion for reflection, identification of issues and questions regarding research practice. Framing research intentions, identification of methods and overall process with regard to research goal revealed the variety of thought within the research community. Research requires publication, lively debate, alternative development paths and most fundamental of all, building on existing research. It requires a community for development.

There is substantial overlap among these four themes. User Studies is a particular form of rich and improvisational collaboration; it uses particular methods and develops its own forms of both knowledge-building and practical research. Design Methods encompass all three topics as it underpins user study with particular methods, or reaches across other domains to support varieties of research or tentatively develops method to enhance and sustain collaborative work. Design Research has a vested interest in the other three as it seeks to define itself more clearly and develop a knowledgebase. Finally, Collaboration is an essential characteristic of all three given its importance regarding the social building of knowledge.

COLLABORATION

USER STUDIES

DESIGN METHODS

DESIGN RESEARCH

Individuals are increasingly aware of the
limitations to their knowledge and skill
in a complex technological and increasingly interactive world.

COLLABORATION

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collaborative work, the question of whether a pattern or
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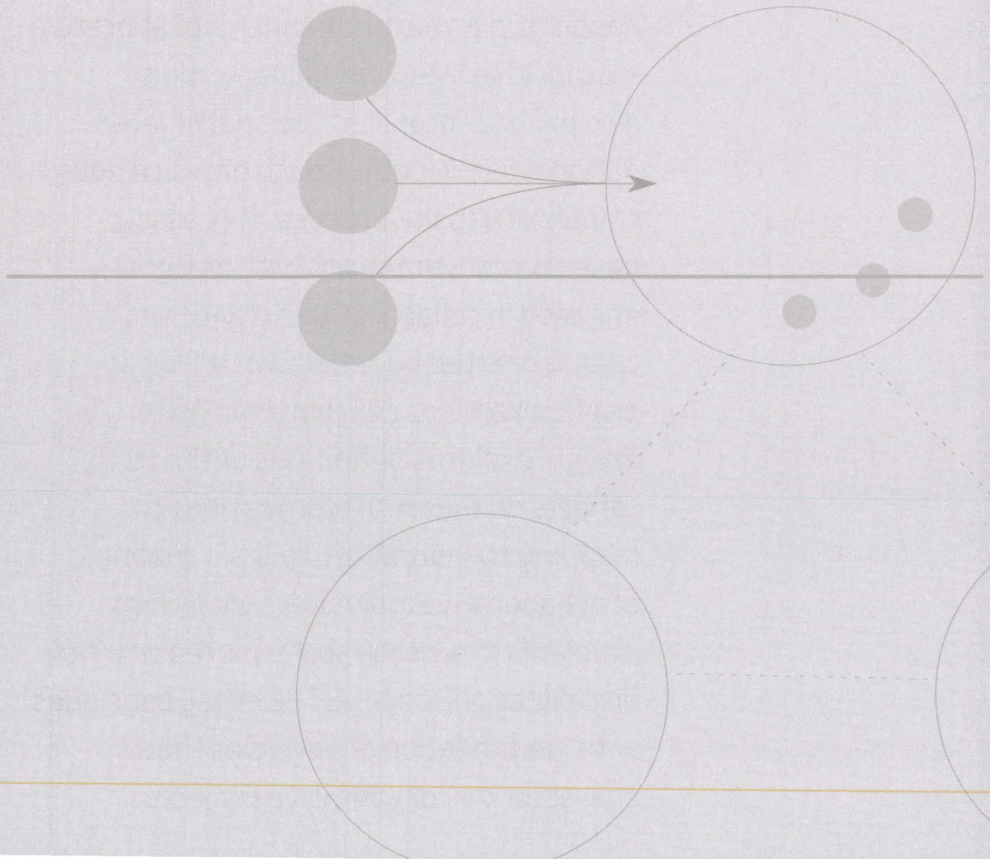

PRACTICING **COLLABORATION** IN DESIGN

SHARON HELMER POGGENPOHL

ABSTRACT:

Occurring more frequently and with greater diversity among participants, collaboration is an activity without substantial theory or process development in design; it happens in an ad hoc manner. Collaboration may involve inter-disciplinary, multi-disciplinary, inter-institutional or inter-national participation, each of which adds complexity to the process. This essay, based on conversations with designers engaged in collaborative activity and complemented by reflective writings, briefly examines collaborative history in design, explores definitions of the term, reflects on theoretical limitations to mapping collaboration, reveals qualities of collaborative individuals, describes problems in process and explores an inter-disciplinary discourse. The essay concludes with identification of variables that characterize collaborative projects.

Individuals are increasingly aware of the limitations to their knowledge and skill in a complex technological and increasingly interactive world.

Disciplines that structure knowledge and maintain boundaries are seeking inter-disciplinary perspectives in the search for new knowledge and solutions to persistent problems. While inter-disciplinary and multi-disciplinary are often used interchangeably, the difference is worth noting. Inter-disciplinary refers to activities that that fall between two disciplines. Multi-disciplinary refers to activities in which several disciplines share perspective (Rogers, 1994, 404). To this is added inter-institutional work that joins strengths not found in a single entity and inter-national work with its border crossing cultural complexity. These are some of the factors that stimulate interest in collaboration in contemporary society; they range from inter-personal through inter-disciplinary to multi-disciplinary to inter-institutional to inter-national. The benefits of collaboration accrue only if its possibilities are understood and managed. To this end, some perspectives on collaboration are developed from selected readings and from the interplay and conversation of individuals who engage in the practice of collaboration. The perspectives are reflective and theoretical, but also practical. They include a look at design collaboration historically, an examination of words relating to collaboration that need careful use, a look at the problem of formalizing or theorizing about the practice of collaboration, a discussion of practical issues regarding collaboration from experiential perspectives and finally a tentative identification of variables that identify collaborative work.

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Collaborative design — its early years

Collaboration has an interesting, if largely unwritten, history in design. It is not a new idea at all. Even in design sources discussing the history of large design offices (the Henry Dreyfuss office, for example) conscious collaborative association of various kinds date to the 1930's. Some of these associations are discussed in *Group Practice in Design*, a mid-twentieth-century book that explores collaborative variations in design practice in the United States and Britain (Middleton, 1967). This is a simpler approach to collaboration than the complexities just mentioned at the beginning of this essay. The book focuses on people under one professional umbrella – doctors, lawyers or designers working together for efficiency and scale to achieve an increase in service to the client and to enhance creativity and quality. Case studies of architecture, interior design, product design, communication design and entertainment (broadcasting) complement the general discussion. Well known architecture firms, Skidmore Owings and Merrill in Chicago and The Architects Collaborative in Boston, for example, as well as the Industrial Design partnership, later called the Design Research Unit in Britain, ground the discussion in a practical way.

Group practice was an ideal some aimed toward as expressed in the following statement (Middleton, 1967, 91):

> **...the idea [is] of [a] group team, composed of talents that are inevitably various and unequal, but which are given the fullest opportunity at every stage to make to the project as a whole such contribution as they may be capable of. In the fullest sense – not easily achieved – the essential purpose of group practice is to link and focus the creative and critical faculties of every member of the team, not just upon one or two facets of the problem but upon every aspect at every stage.**

This is directly counter to the romantic notion of the secluded genius whose suffering, determination and superior creativity brings excellence into existence. Given the complexity of contemporary life, one can be a romantic genius in only a small way, i.e., time is too short to process and master all the knowledge and skill one might want to bring to bear on a project. Consequently, if one aspires to do large or complex work, collaboration provides the only reasonable context for development.

Exploring what is design and what design can contribute resonates even more today than it did then [emphasis added]:

> **It is the perpetual frustration of the designer, be he landscape architect or typographer or product designer, that he is called in too late, when all major decisions have been taken and the project has already assumed such a form that little can be done to it save clean up some of its superficial ugliness. *This is not design.* The elegant design solution is that which meets maximum requirements with the minimum means. This postulates that all relevant factors must be embraced by the creative act of synthesis which we call design (Middleton, 1967, 93).**

And today, we understand that it is unlikely that such a synthesis can be handed off through isolated sequential operations until completion.

In a section titled, Patterns of Collaboration, two primary patterns are identified by their preposition: working *for* and working *with*. In the former, a director tightly controls and designs a project, drawing in others as consultants and workers as needed. In the latter, a group of people share knowledge, work together responsibly and make critical decisions together facilitated by a leader. These remain the most common generic patterns. Walter Gropius, (1953) reflecting on The Architecture Collaborative, wrote that its

organization is based: "...on individual freedom of initiative instead of authoritarian direction by a 'boss'; a belief that by 'synchronizing all individual effort by a continuous give and take of its members, a team can raise its integrated work to higher potentials than the sum of the work of just so many individuals.'" Transforming this idealistic vision of the possibilities of collaboration into reality is not easy to achieve.

Active collaborators define collaboration

In a symposium addressing the issue of collaboration, participants offered their definition of the term. Fourteen people offered definitions, two of them working 'collaboratively.' Table 1 shows the thirteen definitions. An analysis of these definitions reveals the following characteristics. 'Who' or participants in collaborative work includes both design professionals and individuals with different capabilities. 'What' they are doing is quite diverse – negotiating the scope and constraints of their work, sharing knowledge and expertise, combining and negotiating disjoint knowledge, performing productive activities, working together, developing their own knowledge and working in their own best interests as well as allowing actionable entry to others. 'Why' they are doing this is also diverse – maximizing positive results of their activity, achieving common aesthetic, business and social goals, solving problems, achieving success, producing something not otherwise possible and making a better world. "How' they are doing this is also diverse – they mediate, argue, participate, act, react and value in ways that are supportive, selfless, different but complementary, respectful, cooperative, self-satisfied, symbiotic and in a spirit of trust.

What is most interesting in these definitions is the contrast between self-direction and other-direction coexisting in some kind of dynamic balance. The variety of purposes and actions reveal a fluid situation in which improvisation and critical reframing are welcome.

TABLE 1:

Collaboration Definitions

These are the definitions contributed by seminar participants.

DIETMAR WINKLER:

A supportive, to an extent selfless process, sharing one's expertise and conceptual, interpersonal planning or implementation skills for maximizing the positive result of an activity.

ARLENE GOULD:

The coming together of designers from various disciplines along with other professionals to share knowledge and achieve common aesthetic, business and social goals.

CHRIS BARLOW:

Adjustment and combination of disjoint knowledge by diverse individuals.

ALAIN ROCHON:

To put in common, actors whose expertise, knowledge, way of working, personality, etc. are different, but complementary. This action is meant to: solve a particular problem or task, build or disseminate knowledge, etc. within a specific time frame.

DIRK KNEMEYER:

Multiple systems with complementary skills and interests engaged in active, respectful, productive activities to achieve more success.

KEITH RUSSELL:

Collaborate = work together
Elaborate = work it out
Cooperate = do the work together
Collaboration is that form of working together where the working together (is the work) produces an understanding of an outcome (and the outcome) that could not otherwise be produced.

GØSTA KNUDSON:

Develop your own knowledge by solving a problem together with other professions in a way that makes the world a better place in which to live.

JILL DACEY:

Two or more people working together on a project or problem. Best case scenario: when each individual is working in his/her own best interests, that interest contributes to the greater good (solution) to the project or problem. Each participant is self-satisfied.

REGINA DE OLIVERIA HEIDRICH:

Collaboration is a help for different problems concerning education and design study and research.

RUTH LOZNER:

An interactive, cooperative conversation among members who can both contribute and benefit by the outcome and final action.

SHARON POGGENPOHL:

Collaboration is based on a recognition of limitation and the ability to trust others and allow them actionable entry into a situation.

JAY RUTHERFORD:

A group of people with different capabilities that perceive a task or problem to be solved and use their expertise in a symbiotic way to solve it. At the end — ideally — everyone has learned something new — either directly practical or social that they can use in future problem-solving situations.

ROGER REMINGTON & JUDITH GREGORY

Collaboration involves negotiating scope, mediating, arguing, participating, interacting, acting, reacting and valuing within various constraints.

Collaboration and Contribution

Further, the distinction between contribution and collaboration is worth noting. One can contribute to a project without collaborating. In a contribution, one's role is narrowly defined – it may happen in a specific sequence and in a special way. It may be a particular skill one brings to a project. A contributor may also be part of a marginal group who offers aid or support but does no direct work on and is not essential to the project. In contrast, collaborative work cannot be accomplished by a single person; but all so-called team work is not collaborative. Collaborative work is marked by shared decision making, the give and take of ideas exchanged and explored, the integration of multiple perspectives and a synthesis that integrates hitherto isolated ideas. Another way to discriminate between contribution and collaboration is to consider the difference between a hand-off, an overlap and collaboration. The hand-off implies specialized, sequential work with little interaction between phases. An overlap implies some degree of information exchange and adjustment on a short-term basis. The collaboration is a continuous working together and working out performed interactively.

Increasingly we recognize that knowledge is created socially. For example, reading a book consists in knowledge transfer that occurs through the social organization of authors, publishers, libraries, literacy programs, the Library of Congress, schools, etc. It is more than the connection between author and reader, it is shared language, concepts, resources, institutions and other texts. Forming the social and intellectual network for collaboration is similar to this, even if the scale is much reduced.

Given the increasing interest in **collaborative** work, the question of whether a pattern or theory of collaborative practice can be identified is an interesting one.

Collaborative patterns and theoretical limitations

Information work, taken in the broadest sense – whether design research or design practice – often crosses boundaries; such boundaries can be inter-departmental, inter-disciplinary, multi-disciplinary, inter-institutional or international. Each requires particular sensitivity and offers particular collaborative opportunity. Given the increasing interest in collaborative work, the question of whether a pattern or theory of collaborative practice can be identified is an interesting one. Without such a theory or pattern, what remains are case-by-case exemplars.

Collaboration is a social practice without substantial theory. The difficulties of establishing theory are explored by the sociologist, Pierre Bourdieu, whose presentation of a deeper, more philosophical discussion of social space (networks, associations, reputations) and symbolic space (educational perspectives on form and content of knowledge) and its meaning puts a frame to this problem. Practice does not yield to scientific explanation or modeling for two primary reasons: the difference in time and logic. Bourdieu notes (1998, 81) that the time dimension of science and that of practice are alien.

> **The shift from the practical scheme to the theoretical scheme, constructed after the event, from practical sense to the theoretical model, which can be read either as a project, plan or method, or as a mechanical program, a mysterious ordering mysteriously reconstructed by the analyst, lets slip everything that makes the temporal reality of practice in process...Its temporal structure, that is, its rhythm, its tempo, and above all its directionality, is constitutive of its meaning.**

This phenomenon is seen in many abstract diagrams that purport to show design process. What appears to be simple and logical on paper is often a messy practice in reality, full of recursions, feedback loops and unforeseen difficulties. The formal logic of a diagram can be only a primitive guide. Donald Schön (1983) likens design to a process full of uncertainty, ambiguity and value conflict to which we can add emergent purposes in the case of collaboration. These are certainly not characteristics that make for a predictable process; thus we find a situation that is dynamic, causing participants to think and work fluidly and to encounter conflicting ideas, process concepts, criteria and sometimes even difficult personalities.

The logic of practice and theory is also incompatible according to Bourdieu. He states (1998, 81): "A player who is involved and caught up in the game adjusts not to what he sees but to what he fore-sees, sees in advance in the directly perceived present ...anticipating the anticipations of others..." Bourdieu concludes that there is no possibility of giving a scientific explanation of practice (1998, 92):

> **This paradoxial logic is that of all practice, or rather of all practical sense. Caught up in the 'matter in hand,' totally present in the present and in the practical functions that it finds there in the form of objective potentialities, practice excludes attention to itself (that is, to the past). It is unaware of the principles that govern it and the possibilities they contain; it can only discover them by enacting them, unfolding them in time.**

The logic of practice is "things to be done" while the objectified logic of science is representation in a homogeneous (abstract) space.

Turning away from theory, we look to what can be drawn from experience in the practice of collaboration; what follows examines issues related to people, and cultural difference in inter-disciplinary, inter-institutional and international work.

Qualities of collaborative people

Beginning with the essentials, individuals engaging in collaborative activity need to be risk-takers with their ego on 'hold' as they explore beyond disciplinary limits and known boundaries. They experience a de-centering of where they are. Flexibility and a shared vision or at least a common ground ease the exploration among diverse individuals, however, the paramount characteristic is trust. Participants have different knowledge and cannot validate each other's work; furthermore they have different perspectives and use different processes. In order to engage in the situation's ambiguity and work within cognitive complexity, trust is essential. At a less obvious level, collaborators need to respect each other's personal preferences – where someone thinks, for example, through abstractions and formal logic, or through more concrete and detailed speculation. Such differences need to be appreciated and supported. Attention to stakeholders in all their variety and need is a prerequisite, as is attention to the collaborative process itself. It is a mistake to focus solely on the problem, project or task at hand. Team maintenance as well as personal growth and satisfaction are essential if the collaboration is to succeed. Collaborative work requires attention shifts – between project and team, between personal and group goals and between one's own disciplinary perspective and that of another.

People however have limits to their ability to be process connected: in a physical and mental way; with regard to time constraints and its management involving access and priorities; in their ability to coordinate with others; and in their basic limited consciousness. Technology has promised increased connectivity, however this too must be managed to be an asset rather than a tool that fragments time and distracts concentration. While the promise of transparency is largely unfulfilled, an intranet on which progress can be posted and issues raised as they are encountered, allows participants to update their understanding of the enterprise when they have time. Not all information can be transferred through technical mediation; sensitivity to the need for face-to-face interaction is required. Meetings maintain engagement, keep context and goal in focus and provide

for cohesion among the collaborators, but even meetings need efficient management so they avoid becoming time sinks.

Leading a collaborative process is demanding. Besides the obvious accountability for budget, time and expectations, the leader is responsible for and owns the process and the transfer of knowledge – she/he takes responsibility for making things happen. The scope of the task is large, from managing and delegating tasks, to monitoring progress, quality and end result, to team dynamics, to setting expectations and attending to all stakeholders. The leader needs to provide guidelines for development and provide both social glue and oversight of the process. In relation to the participants, there is a need to define common goals, facilitate exchange of values and contributions, define roles and responsibilities, provide constructive criticism, build positive reinforcement and help all to stay connected to the process. Use of communication tools and progress reports need to be efficient and in tune with participants' information needs and time frame. Building a shared language and process is essential for inter-disciplinary teams and this in itself is no easy task. Again use of an intranet can provide a ready reference for terms, a means to follow progress and a strategy for tapping multiple ideas when problems occur.

Process coordination requires an overview of structure and flexibility of thinking about the structure so that when contingencies arise, they can be worked around or overcome. Not only adaptability in process, but adaptability with regard to teamwork is needed. Facilitating decision is not always obvious – knowledge of individual styles of thinking, careful listening to reluctance or counter argument is often needed. Interpersonal conflict will occur, requiring the leader to have good interpersonal skill, the ability to be ecumenical and empathic and to know what is negotiable. Survival of groups and teams often depends on 'controlled friction' (Middleton, 1967, 287). Even working through difference may yield surprising and valuable results. Individual levels of ownership, influence and participation

color these conflicts. And how value conflicts are dealt with need attention. Face-to-face discussion is nearly always essential; in contrast to complexity that can be monitored more technically. Compromise, consensus or executive decision may all have a role in moving a collaborative project forward; yet which approach is appropriate when remains an open question.

Collaborative process brings many people into association, beyond mission and goal. All need to understand the metrics for success and be able to assess progress holistically. Not everything is done collaboratively; individual participants need to be aware of their intersection points with others – the points of collaboration – so these moments are met and maximized. These are often focused on synthesis in which artifacts represent current progress and illustrate ongoing problems or opportunities. Feedback and clear understanding of next steps result from these collaborative points. Many projects go through cycles of contribution and collaboration. Orchestrating work to be done independently increases efficiency and supports collaboration effectively – intellectually, creatively and socially. (Figure 1 presents an abstract schema illustrating over time a few elements of the collaborative process.)

Building a network of individuals who can work together is not a simple leadership task, but is one that requires constant attention to the process and the people. Charles Eames likened good collaboration to a circus; it can also be likened to jazz. The collaborative problem/process/project is evolutionary but not completely organic in form. In a surprising way the need is for focus on the group and its connectivity rather than on the problem. Protocols for working together are both established and evolve, while creativity relates to individual change and transformation.

FIGURE 1:

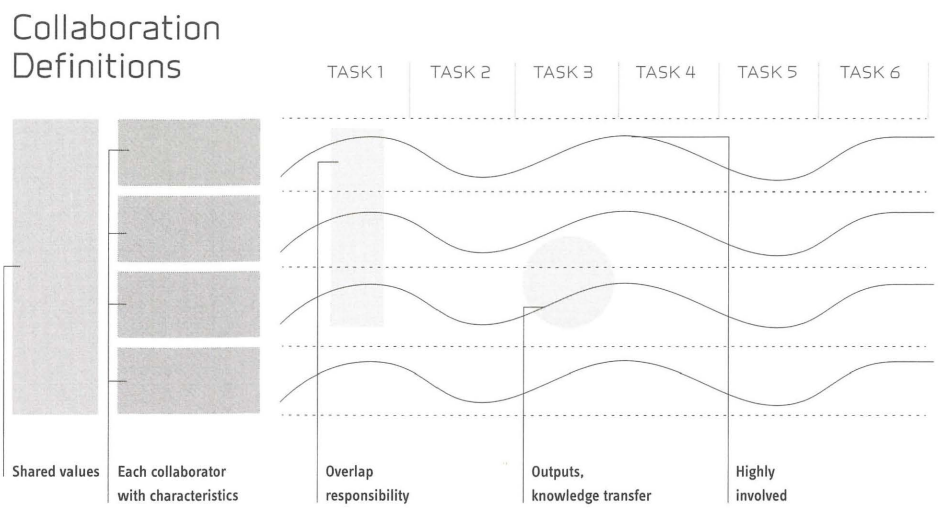

Figure 1: A conceptual collaborative schema that identifies shared responsibility, key collaborative moments relating to output critique and knowledge transfer and the fluxuating involvement of team members. (Contributed by Maria Giuduce.)

Interdisciplinarity and evolving a discourse

Design, a weak discipline, is at a disadvantage in inter-disciplinary work, if considered from a traditional academic perspective. Its body of knowledge is not well established in contrast to other disciplines. But considered from design's strength, its ability to absorb ideas into a working synthesis, it can play a significant role in collaborative activities. Again we run into Bourdieu's contrast between science and practice.

> **"...disciplines are prevalent organizational principles in universities, where the goal of knowledge production is to understand; they do not seem to command great respect where the goal is to generate practical knowledge in order to solve problems. In fact, there they are even frowned upon as obstacles to innovation or as providing a skewed perspective." (Weingart, 2000, xii)**

Designers have always worked collaboratively with service people (printers, for example) as well as other professionals in similar communication-oriented disciplines (writers, photographers, exhibit designers, etc.) However current collaborations are much more extensive and diverse, including those with computer scientists, psychologists, industrial designers, business people, sociologists...the list could go on. These more recent collaborations are often team based and find individuals bringing to the problem (situation, opportunity) diverse perspectives that forge a new vision of possibility. Current focus on interdisciplinarity (Weingart, 2000, 2) looks to the promise of "cognitive and organizational innovation through evolution by variation, diversity, and combination." This is substantially different than organizing many people with unique contributions, each of which is a component of the whole, moving toward a known result orchestrated by one individual. Important problems and opportunities today tend to call for multiple perspectives, with decision-making shared among several people. "Interdisciplinarity is a set of dynamic forces for rejuventation and regeneration, pressures for change, and the capacity for responsiveness. It is the necessary 'churn' in the system. Interdisciplinarity entails knowledge negotiation and new meanings...." (Klein, 2000, 21). Such situations call for different skills in discourse and negotiation coupled with communication, prototyping and social skill that can anchor the work and bring out the best from all participants.

Cultural aspects of collaboration

A way to examine discourse and the way process evolves, based on framing and ultimately on decisions regarding choice, is to look through a cultural filter. Disciplinary differences contain cultural presumptions with regard to epistemology for example. Through such presumptions or styles of examining the world, one discipline can feel superior to another; clearly this not a trivial matter in interdisciplinary work. Rainier Bromme (2000, 125) comments:

> As a discipline's epistemic style contains a significance guiding both activity and cognition and thus also a normative component, it may well be expected that it contributes to stereotypes of this kind [disdain between various disciplines]. This again affects how open-minded a researcher will be about data, proofs, and refutations obtained on the basis of other epistemic styles.

This statement reveals what is perhaps the most stressful and disorienting aspect of inter- or multi-disciplinary activity.

Donald Schön (1994, 31) following Thomas Kuhn and Richard Rorty discriminates between normal and abnormal discourse in science as well as in other fields of inquiry. Normal discourse:

> ...proceeds under a shared set of rules, assumptions, conventions, criteria, and beliefs, all of which tell us how disagreements can be settled, in principle, over time....Abnormal discourse occurs, by contrast, when agreed-upon criteria for reaching agreement are not present as a basis for communication among the contending actors. Such situations are not defined by the participants in terms of an objective framework within which disagreements can be arbitrated or managed.

Comfort is attached to normal discource. As mentioned previously, in inter- or multi-disciplinary work a hybrid discourse must be invented in which all participants can operate with respect and understanding, if they are to get on with an inquiry that is an interplay of thought and action. The extreme importance of communication is emphasized by one author (Maasen 2000, 177):"Interdisciplinarity, according to my thesis, is primarily a matter of preparing the grounds for communication among a variety of specialized discourses to occur."

Perhaps two of the largest issues are: 1) sorting out and agreeing on the meaning of terms which may have different reference in various disciplines and 2) negotiating process. Often process is a hybrid that unites or overlays particular actions and operations; this can result in a changed sequence or a later and more complicated synthesis.

While there are problems and fault-lines associated with inter- or multi-disciplinary work, Klein (2000, 6) identifies five patterns of disciplinary relations that also identify the benefits one might obtain as a result of engaging in such work, The patterns are:

1 developing conceptual links using a perspective in one discipline to modify a perspective in another discipline

2 recognizing a new level of organization with its own processes in order to solve unsolved problems in existing fields.

3 using research techniques developed in one discipline to elaborate a theoretical model in another

4 modifying and extending a theoretical framework from one domain to apply to another

5 developing a new theoretical framework that may reconceptualize research in separate domains as it attempts to integrate them

Beside inter-disciplinary cultural bias, there is institutional bias. When institutions collaborate, other kinds of process must be negotiated: the nature and extent of the collaboration, issues of fairness with regard to finances and work load, details with regard to control and responsibility. In the course of work, these are significant agreements. "Institutional action frames are the beliefs, values and perspectives held by particular institutions and interest groups from which particular policy positions are derived..." Metacultural frames are "...the broadly shared beliefs, values, and perspectives familiar to the members of a societal culture and likely to endure in that culture over long periods of time, on which individuals and institutions draw in order to give meaning, sense, and normative direction to their thinking and action..." (Schön, 1994, xiii).

Inter-national usually means inter-cultural collaboration as well. Basic issues to consider in these situations include differences in resources and infrastructure, not just technologically but in terms of access; economic framework; definition of context – what is included and what excluded. Attitudes toward time at both the micro and macro level – for example will meetings start on time? Or is sustainability measured in decades or centuries? Simple concepts such as what is a family or a leisure activity may have unfamiliar or subtle differences in meaning. Communication and collaborative character may also be different because of a particular social style related to work or the power distance between participant and leader. Language differences can confound translation requiring extra sensitivity and skill to come to an understanding. Criticism may take a very different form in delivery and response and decision-making may not be a clear or open process. These are only a few of the delicate issues that inter-national collaboration might spark.

Variables that characterize collaborative work

While the previous ideas range from fairly specific to broadly general, the people gathered to discuss collaboration – all designers – desired some synthesis; something beyond a summary – something more operational. Keeping in mind Bourdieu's cautionary statements about essential time and logic differences between what is science and what is practice, the expanding collaborative situation in which we work stimulates a need for order and understanding. This is not from a particular disciplinary perspective, but in a pattern-finding manner, close to practice. So in a tentative way, the exploratory conversation among experienced collaborators turned to a discussion of variables (see *table 2*). These are some of the distinguishing features of collaborative projects.

TABLE 2:

Collaboration Variables

Identification of collaboration variables (category and variable in left and middle) with a sample project played out against the variables (on right)

CATEGORY:	VARIABLES:	EXAMPLE USE:
CONTEXT	Project Research Teach	Research
GOAL	Apply knowledge Create knowledge Transfer knowledge	Apply knowledge Create knowledge Transfer knowledge
LOCATION	Regional National International	International
INSTITUTION	Industry University Foundation Government Competitor Non-competitor	Industry University Competitor
CULTURE	Single Double Multi	Single Double Multi-cultural
DISCIPLINE(S)	Same Dual Multi	Same
LEADERSHIP	Formal Informal Preset control Adaptable control	Preset control Adaptable control
PROCESS	Established To be negotiated Evolutionary	Evolutionary
SCALE	Small Medium Large	Large
SPEED	Fast Medium Slow	Slow
LONGEVITY	Defined end Sustained	Sustained
PROXIMITY	Face-to-face Distant	Distant
FUNDING	Funded Unfunded	Funded
ASSESSMENT	Internal External	Internal External
RISK	Low Medium High	Low
DOCUMENTATION	Detailed General Process Result Formal Informal Internal External Public Proprietary	Process Result

Against this outline characterizing collaboration, a project was drawn as an example, to see if the variables made sense. It was easy to pull from the single collaborative example project its position relative to the variables. It may be that these variables are too simplistic, but our sense was that the rich combinations, in which they practically occur might serve as an opening with which to gather patterns of collaboration and learn from individual and accumulated cases about their similarities and differences. Perhaps a database could be assembled using these variables as classificatory tags and over time patterns would emerge identifying a typology of collaboration. Destined never to be a science, collaborative performance nevertheless could be enhanced if we better understood its dimensions and variations.

Finally, what became abundantly apparent through our discussion was the essential need for good communication, social respect, shared values, clear administrative structure and responsibility in order to foster a harmony of minds.

| ACKNOWLEDGEMENTS |

Conversations are often the product of several people, but this essay is the product of thirty individuals over two days sharing experience and insight with a view to developing a better understanding of collaboration. I thank my co-conspirators and collaborators: Chris Barlow, Jill Dacey, John Demao, Maria Giudice, Arlene Gould, Judith Gregory, Regina de Oliveria Heidrich, Hsin-Chien Huang, Jo Hyunshin, Dirk Knemeyer, Gøsta Knudsen, Ruth Lozner, Simona Maschi, Don Newgren, Christena Nippert-Eng, Roger Remington, Alain Rochon, Keith Russell, Jay Rutherford, Marian Sauthoff, Napawan Sawasdichai, Peter Simlinger, Zoe Strickler, Patrick Whitney and Dietmar Winkler.

Beyond insightful conversation several individuals offered case studies or reflections from their experience. They are: Chris Barlow, Redefining creativity for intercultural/cross-functional success; Jill Dacey, Development of international core competencies and student/faculty exchange in information; John Demao, Cross-cultural multi-national collaboration; Maria Giuduce, The collaborative challenges between information architects and visual designers; Regina de Oliveria Heidrich, International exchanges; Hsin-Chien Huang, Living in a mirage; Dirk M. Knemeyer, Global collaboration network; Simona Maschi and Christena Nippert-Eng, Privacy and services; Don Newgren, Design Research Institute; Roger R. Remington, National graphic design archive; Alain Rochon, Simplification of governmental public communication: a holistic approach; Jay Rutherford, Learning design online?: Medienquadrat; and Patrick Whitney, Collaborative research: Global companies – local markets.

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A CASE STUDY IN **COLLABORATION:**

Looking back at the National Graphic Design Archive

R. ROGER REMINGTON

ABSTRACT:

Inspired by the1980s interest in graphic design history, an initially productive, but difficult to sustain, collaboration among three American universities from the late 1980s to the mid-1990s, is the subject of this case study. The ideas behind a much-needed archival consortium, its organization and its difficulties in sustaining collaboration are examined. The essay concludes with constructive suggestions for reflection on collaborative associations between institutions.

Today collaboration in a professional design context is the norm, working as an effective strategy for individuals, groups, companies and institutions. On a basic level, even though design students often work individually on projects in school, when they enter professional practice, they must function as members of interdisciplinary problem-solving teams with shared responsibilities and specific competencies.

The word collaboration has at least two meanings. In the past, "collaboration" had sinister implications such as collaborating in a crime. During World War II it also had a negative connotation, referring to those individuals who identified with the axis enemies. Today collaboration has a positive bent; it stands for working together cooperatively. In his book, *The Planning of Change*, Warren Bennis (1969), a management science guru from the late 1960's, provided a detailed and useful definition of the collaborative relationship. He wrote:

a collaborative relationship is a complex series of expectations and encounters which include

- **joint effort that involves mutual determination of goals;**
- **spirit of inquiry–a reliance on determinations based on data, publicly shared;**
- **relationship growing out of a concrete, here-and-now encounter;**
- **voluntary relationship between change agent and client with either party free to terminate the relationship after joint consultation;**
- **power distribution in which the client and change agent have equal or almost equal opportunity to influence one another;**
- **emphasis on methodological, rather than specific, substantive goals.**

The history of the National Graphic Design Archive is an instructive illustration of collaboration among three institutions of higher education. This brief case study documents a vision that led to a national collaboration including determination of its purpose and its history. This essay concludes with commentary about the successes and shortcomings of the joint venture which will provide interested readers with constructive suggestions for entering collaborative relationships.

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During the 1980's, an interest in the history of the field of graphic design emerged. This manifested itself in important events such as the publishing of *A History of Graphic Design* by Philip B. Meggs and the "Coming of Age" conference on graphic design history at Rochester Institute of Technology (RIT). In tandem with this trend came the need to preserve and document this history. Many modernist design pioneers were passing on; their professional archives were important historical records needing to be saved. Several universities began developing archive projects. The University of Illinois at Chicago (UIC) collected materials about the history of Chicago including special collections such as that from Container Corporation of America. Cooper Union (CU) had acquired the archive of designer Herb Lubalin and turned it into a center for history and interpretive exhibits. Rochester Institute of Technology acquired designer Lester Beall's archive, cataloged it and developed an interactive image bank. Professor George Sadek of Cooper Union in New York and colleague Marilyn Hoffner conceived a national project to bring together several leading institutions with the intent that eventually others might join in a national network. Initially the other participating schools were the University of Illinois at Chicago (Gretchen Lagana and Beverly Lynch) and Rochester Institute of Technology (R. Roger Remington). Each institution had its own collection focus, policies and working organizational structure. At Cooper Union, the Lubalin Center is part of the School of Art. At UIC and RIT, the archives were part of the university libraries. Each school had faculty and staff advocates who were teaching design history and utilizing the original source materials in the classroom. Although different in many ways, each school was in agreement about the importance of preserving historical exemplars of the history of graphic design and of the potential for sharing their experience and knowledge with others.

Cooper Union was successful in obtaining a grant from the National Endowment for the Arts to support the formation of a consortium. Implicit in this was the fact that each school would be required to support the project with funding and in-kind resources. Meetings were held at each of the three schools and, after extensive discussions, a vision statement was written and adopted:

The National Graphic Design Archive is

...a consortium of individuals and organizations that will systematically coordinate the archiving, documentation and interpretation of the artifacts of the history of graphic design in America so that this heritage will be preserved for the future.

There is a national need to identify and facilitate access to the artifacts of the history of graphic design in America to insure that these materials will be saved and made available for study, reference and interpretation throughout the country. The NGDA will be an innovative network of people, projects and institutions that will provide collecting frameworks, investigate appropriate technology for the documentation, access and sharing of materials electronically and become a clearing house for information about this history. NGDA intends to be perceived by its users and others as being a reliable, technologically oriented, productive and approachable institution.

To accompany the vision statement the three schools added a set of goals:

1 To coordinate the collection and preservation of significant images and data about the history of graphic design
2 To utilize the database for educational and informative interpretive programs as demonstrations
3 To apply appropriate technology for the development of pilot programs, networking and sharing of information
4 To disseminate information about NGDA, its activities, products and goals
5 To seek ongoing development resources to sustain the organization and its activities
6 To develop a functional organizational structure that will enhance the project operations and activities
7 To regularly evaluate the organization and modify it as necessary

According to these goals, a work plan was developed with each school involved in developing parts of the project according to their unique strengths and resources. Cooper Union administered the National Endowment for the Arts grant and developed interpretive programs through the Herb Lubalin Center. UIC worked on contributing descriptive standards for archiving graphic design materials. RIT offered consortium planning expertise, production of an interactive image bank, printing of a global "what's where" directory of design archives and produced a NGDA newsletter. (See *figure 1* for a description of the collaborative elements.) Expanding the network proved difficult as the three original schools had not yet developed a functional relationship to fully meet the NGDA goals. Others, on a program basis, joined the consortium. MIT, the Society of Environmental Design and Westvaco Corporation contributed to the interactive image bank prototype. Between 1989 and 1994, the span of NGDA's formal existence, changes in personnel occurred at the participating schools as newcomers infused new energy into the original vision. The consortium received continuing funding from the NEA through the mid-1990s, but full participation began to wane. In time resources became more limited and several of the sponsoring schools felt internal administrative pressure to "pull back" the effort in order to support internal goals that were, in effect, more controllable. In addition, there were perceived inequities with the project load and deliverables, questions about equitable resource allocation and resistance to a tighter, more structured organization plan that was fully understood and agreed upon by the schools. When one member proposed a working structure for the consortium and its program development process, others felt threatened by the implicit discipline involved. So there was a fundamental difference of preferred organizational style among the participants ranging from a very loose, figure-it-out-as-we-go style to another school who was advocating a systematic form. One founding member institution chose to retire from participation and focus on internal priorities. The two remaining participants continued for several years in the mid-1990's, maintaining a new website image bank under the NGDA banner at Cooper Union.

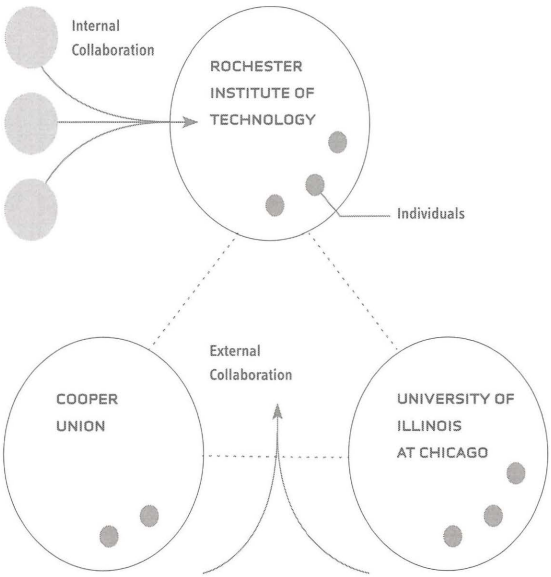

FIGURE 1:
Network building

There were considerable differences among the schools in their digital capabilities and technical support. This created a serious imbalance when it came to delegation of resources as the institution with the greater computer resources felt the need for more of the grant monies. Another larger technical difficulty was that the Macintosh computer and the Internet were in early stages of development so the three schools were wed to different existing technologies. If the consortium were to begin in 2003, the technology issues would be fewer. The National Graphic Design Archive, which had started out with such grand expectations and potential, diminished ultimately in realizing its major goals of collaboration toward a functional national network. It was a victim of the risky challenge of inter-institutional collaboration.

In retrospect, what lessons were learned from this project? What might institutions be aware of as they sense a need and respond to a motivation to work together in addressing a common challenge?

What follows is one participant's look in the rearview mirror, offered as a set of constructive suggestions for future collaborative ventures between institutions:

- Consortia provide excellent opportunities for participants to evaluate their own work in relationship to others.
- Consortia are very appealing organizations for funding agencies and foundations.
- When establishing a consortium, there needs to be a conscious equity in every aspect of the project, in the organization, in the mission, in the administration and organization, in the program development plan and in the expected deliverables.
- Participants must realize up front the amount of energy and passion that will be necessary to overcome the lethargy and pressure for maintaining the separate institutional status quo.
- The consortia should consider hiring an organizational consultant to bring objectivity to the planning process.
- In the initial planning, the group should emphasize strategies for sustaining the vitality of the organization into the future.
- Participants should read the current and classic literature on organizational planning such as the book, *Why Change Doesn't Work* by Robbins and Finley (1996).
- From the outset, participants should devote time, energy and resources to monitoring the psychodynamics of the organization itself and the means by which participating individuals interrelate.

Sociologist Warren Bennis (1969) was realistic when he wrote, "Collaboration is always an achievement not a gift. It is usually attained through open and grueling confrontation of differences, through conflicts faced and resolved, through limited areas of collaboration growing into larger areas of collaboration as fuller trust develops." Finally, when thinking about collaborative relationships, it is instructive to remember the wisdom of the Gestalt psychologists when they offered, "the whole is different from and greater than the sum of its parts."

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| RESOURCES |

USER STUDIES

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User Studies: Finding a Place in Design Practice and Education

COLLABORATION

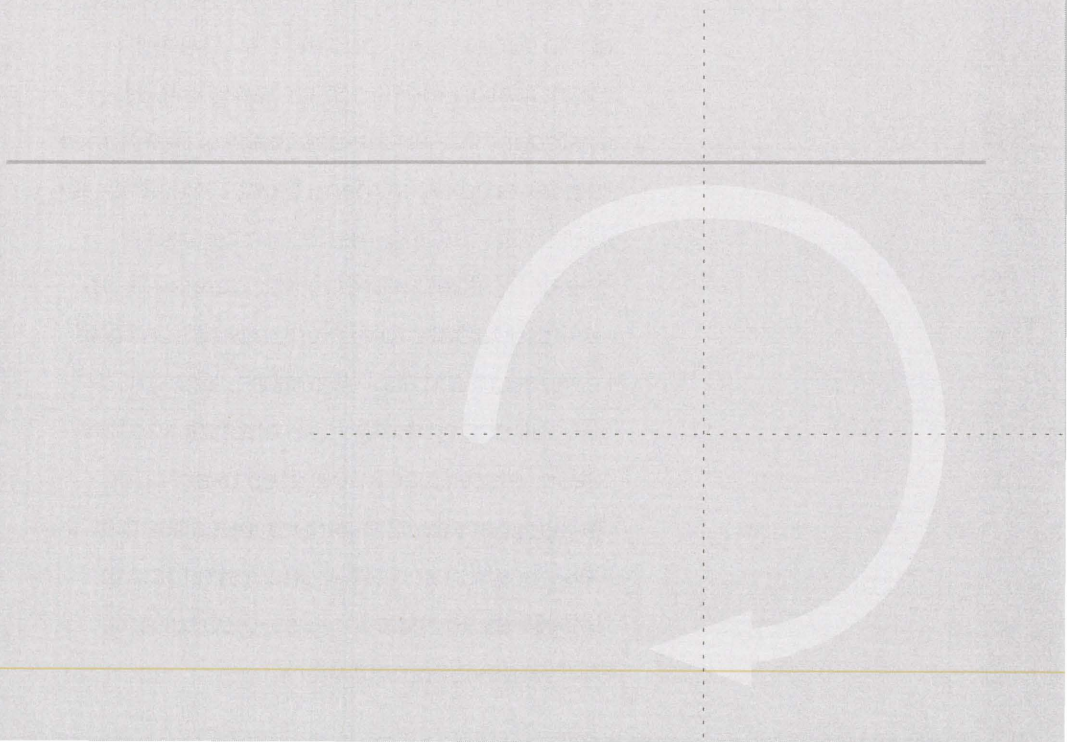
DESIGN METHODS

DESIGN RESEARCH

USER STUDIES

How do we convince designers of the value,
the utility of user research?

Why do we need to convince them of something that seems so obviously
critical to successful design?



USER STUDIES:

Finding a Place in Design Practice and Education

JAY MELICAN

ABSTRACT:

User study is investigated through discussion among practitioners whether in industry or education. Issues of terminology, the early efforts to study users along with more recent approaches such as context determination are explored. Arguments for these studies revolve around economics - is there a pay-off to such study - and ethics - rooted in participatory design and championed by designers. Nevertheless there is resistance to user studies on many fronts. Weaknesses in the various arguments are revealed. The difficulties in practically moving from user study data to design implications and realization are also examined, along with various design method strategies and how these relate to an integrated user study / design process. The general need for method classification and clear understanding is flagged as an issue in cross-disciplinary, shared development work

It may be that our work is too specialized – that there are simply not that many people whose job it is to plan and conduct user studies for design. On the other hand, it may be that it is commonplace – an activity that nearly all designers do but that few would feel warrants any special attention. It could be that we are isolated from one another by the institutions in which we work – that our work is located across dissociated industries; we work on medical equipment, high-tech consumer electronics, home appliances, retail environments, automobiles, etc. Or is it that our jobs scatter us throughout organizations – in marketing departments, on product teams, in research labs – to such a degree that we never meet as colleagues to discover that we share common pursuits and concerns? It may be that we just don't have *enough* in common, that we do not all consider ourselves ergonomists or usability analysts; that we are designers, and anthropologists, and sociologists and psychologists and computer scientists.... It might be that we just weren't sure there would be enough for us to talk about if we were to come together.

Whatever the reason, there seem to be few official occasions that bring together the diverse group of academic and industry researchers involved in user studies for design. When the occasion presented itself during the 2byTwo Symposium held in Chicago in May of 2003, it turned out that the user studies community has more than enough to talk about. In fact, some fundamental issues were discussed and debated, including questions of who we are, what we do, how and for whom we do it. Highlights of those discussions are presented here.

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Who is the user? Who are we? And where do we go from here?

One of the liveliest debates – having spawned two published responses since the symposium concluded (Marcus, 2003, Knemeyer, 2003c) – was initiated by Dirk Knemeyer's challenge, directed at the user studies community, to find a better term than "user" to describe those individuals with whom we engage during our design process and who themselves engage with the end results of that process.

As a designer of dynamic, web-based information systems, Knemeyer takes the position that the term "user" is the anachronistic remnant of times and technologies past. When software interfaces were slow and inflexible, designers may have been primarily concerned with communicating to "users" the procedures they were intended to follow. But people do more than *use* a web site; they interact with it, play with it, are entertained and informed by it; they converse with its owners, post their comments, critique its content and design, contribute to its creation.

"The term 'user'," Knemeyer (2003a) writes, "reduces those who interact with our creations to something almost sub-human, a piece to be moved around on a board, as opposed to a rich, multi-faceted person." He suggests that we adjust our use of terminology to reflect the shift into a "participation paradigm" (Knemeyer, 2003b). Designing *with* "participants" rather than *for* "users," Knemeyer argues, we explicitly recognize the symbiotic nature of our relationship. Participants may engage in active, extended, vested relationships with designers and their creative work.

New technologies and new media – specifically the Internet – clearly play a part in provoking this reconceptualization of the relationship between designers and "users"/"participants." New media, in fact, may have lived up to (and outlived) the hype that surrounded its debut in the early 1990s. Who then could have imagined that a single, and fairly typical project for a web designer in the early twenty-first century might call for expertise from domains as diverse as publication layout, motion graphics, broadcast standards, game development, software engineering, interface and interaction design, identity and branding...? What designer of printed communications could have fathomed the impact that the World Wide Web would have on his rarefied technical skills? Who could have dreamed that published content might so easily be reshaped in response to readers' feedback – in response to "users'" patterns of interaction with it? And who would have thought that "users"would so quickly come to expect and demand the opportunity to express their opinions? Or that each user interaction, any page-turn or mouse-click might be instantaneously logged, analyzed and fed back into a digital process of individually customized redesign? Who could have imagined that it might be so difficult even to distinguish the designers *from* the users?

While the "participation paradigm" may have sprouted from the opportunities and exigencies of web-based design, the sentiment it captures is not limited to that domain. The "user" in user studies is a term that many of us would agree seems somehow inadequate, possibly even demeaning. After all, it carries with it connotations of exploitation and drug addiction.

In response to Knemeyer's appeal for an evolved terminology, Aaron Marcus (apparently unconvinced that "participant" represents the only or most suitable alternative to "user") has compiled a list of labels that he has encountered over the years in his dealings with clients from a variety of industries. In certain circumstances "users" may be: actors, addicts, consumers, customers, guests, human beings, learners, men, objects, occupants, participants, persons, patients, people, readers, subscribers, stakeholders, subjects, targets, victims, viewers, visitors.... (Marcus, 2003) Each nuanced term suggests concern with a particular aspect of our "user"; each suggests a certain relationship that we as designers might adopt vis-à-vis the "user." Some terms could be considered politically incorrect; some seem potentially too restrictive in allowing us to consider our "user's" full experiential range. In the end – and despite general acknowledgement of its shortcomings, it is difficult to come up with a satisfactory alternative to the term "user." None other seems suitable for as many occasions. (For lack of a better term, and at least for the purposes of this report, "user" will have to suffice.)

In any case, the real issue here is not which word we prefer – not whether, as a community, we can agree on one term to serve our many purposes. The real issue is the fact of the debate itself, which Marcus (2003) suggests "...is evidence of a profound change in the profession that focuses increasing attention on user-centered design, user profiles and use scenarios."

It could be argued that the design professions have, in fact, changed even more profoundly than Marcus supposes. A cursory review of the current state of user studies – of prevailing theoretical and methodological tendencies – certainly seems to confirm that the field has shifted its attention away from a narrow focus on isolated objects, tasks or screen interfaces. Further, it suggests that the scope of our inquiries already has begun to outgrow interpretive devices such as user profiles and use scenarios – which all too often come off as two-dimensional, stereotypical, uninspired and uninspiring representations of the rich complexity of human experience. Currently, user researchers are struggling with how to capture, understand and represent this complexity in a way: that genuinely respects the user; that recognizes the inter-connectedness of the micro-scale (of individual user/product interactions) with the macro-scale perspectives (of social, industrial and natural systems); and that is meaningful and useful to the process of designing innovative and more humane applications of technology.

The past two decades have seen significant shifts in the design professions and in their acceptance and incorporation of user studies. These changes have been encouraged to a significant degree by design professionals involved with the development of computing and communication systems or of high-tech consumer electronics who are called upon to design "user experiences" rather than isolated, single-task-oriented tools.

But there have been multiple simultaneous threads of practical and theoretical development leading up to this point in the history of user studies for design. Architectural design led the way with early environment-behavior studies, post-occupancy evaluations and the development of participatory techniques that included voices from the community in the processes of urban planning. In the domain of systems and cybernetics, procedural models of user activity have evolved into complex models of socio-technical systems. The sphere of ergonomics and human factors has expanded from an exclusive concentration on users' physical and cognitive capabilities and limitations to include

consideration of the softer, social and cultural (and even emotional) factors that influence design. (Whitney 1993).

Early research, conducted by Lucy Suchman and others (Suchman, 1987), demonstrated that user actions and interactions are not easily described or prescribed through procedural models – that, as designers, we need to concern ourselves with the situation, the context in which a designed object will be used or a task accomplished. Having learned the value of understanding the context in which users interact with an artifact, message or system, design researchers more recently have turned their attention to clarifying exactly what might constitute that context of use.

Again, we find the advent of new technologies – especially ubiquitous, environmentally-embedded computing and communication systems – figure as a primary driver of this quest (Swanson et al., 2003): "As technology systems within organizations grow more complex, encompassing a greater variety of users, tasks and environments, the contexts in which they are used increase in both number and diversity. 'Context' no longer is a single monolithic entity encompassing the entire system, but a collection of smaller, more specific contexts."

Swanson, Galvao and Sato define context as comprising anything that indirectly affects a system and its use. Context must be understood, they claim, as comprising, at the same time, global and persistent elements – such as institutionalized roles, relationships and practices – and the local, ephemeral constellations of influences that shape any single situation of user/system interaction. These global and local forces of influence could include the physical environment, economic and regulatory environments, the social relations in which an interaction or activity of use is implicated, cultural mores and customs and organizational policies and practices, familiarity with and acceptance of technology, biographical histories or individual users, their attitudes and beliefs, their familiarity with and acceptance of a technology or way of accomplishing a task.... (Swanson et al., 2003) Such a broad definition of context implicates a

dizzying array of possible influences. Each of those forces need to be understood, but, Swanson and his colleagues suggest, understood only in terms of their potential or actual influence on the system's use. A complete examination and analysis of context in this sense would require the analytic contributions of a formidable cross-disciplinary team.

This project of redefining context is in keeping with a larger trend: an expansion of the scope of user studies, or, perhaps more accurately, the evolution of a dual focus. While keeping sight of the details, researchers are zooming out for a look at the big picture as well – designing for a particular point of user interaction and, at the same time, considering the dynamics of large scale social systems and contemplating the reciprocal influences of human behavior and material culture.

We can see this dual focus as corresponding to the distinction between constructionist and structuralist schools of social theory or, in terms of research approach, between the ethnomethodological and the ethnographic. While the ethnomethodological approach focuses in on the meaning of a particular interaction as it is interpreted "on the spot," the ethnographic school takes a more expansive view of how interactions are structured, and webs of meaning constructed, within a social group or community.

As the knowledge base of user studies expands, as practitioners continue to push at the edges of their discipline, stretching its boundaries and finding its connections to other fields, the challenge we face as researchers is one of explaining and demonstrating how such studies fits with design. How do we fit it into design projects – as far as a project manager is concerned, as far as a client might be concerned, as far as the designer him- or herself is concerned? How do user studies fit in the design process? And, as a sub-discipline, how should it fit within the design curriculum and the design classroom?

Making the Case for User Studies

Our two-day assessment of the current state and possible futures of user studies in design culminated in the collaborative generation of an outline for a hypothetical textbook (*see figure 1*). We decided that the first chapter of a textbook should be titled "Why Study Users?" It is a question posed frequently and from many directions – a request to provide some rationale for the time and expense required for user studies, a demand to justify what we do to others and to ourselves. In answer to it, we might resort to a variety of different arguments: an economic rationale, an ethical rationale, a practical rationale.... Often times it is not simple, in making any of these cases, to argue from a position consistent with dominant ideologies of post-industrial corporations and of the design profession.

FIGURE 1:

		Understanding the Fundamentals	Explore Project Content	Create User Research Plan	Conduct Research	Evaluate, Reiterate	Intergrate with Design Process
CH. 1	Why Study Users?	○					
CH. 2	Who are Users?	○					
CH. 3	Historical Development of User Studies	○					
CH. 4	Ethical Treatment of Human Subjects			○	○		
CH. 5	User Variables		○	○	○	○	
CH. 6	How to Learn about Users			○	○		
CH. 7	Getting from User Studies to Design			○	○	○	○
CH. 8	The Future of User Studies	○					
CH. 9	Vernacular Design & User Customization		○	○			○
CH. 10	Managing User Data		○	○	○	○	○

Figure 1: Chapter titles of a hypothetical textbook on user studies and the phases of the design research process to which they correspond.

An economic rationale is demanded by the department managers, by project managers who need to be convinced that the research phase of the project should be scheduled for more than three days, by the client who wonders what exactly is going on during those blocks of costly consulting time set aside for research. Attesting to the difficulty of constructing a convincing economic rationale is the predictability with which conference workshops and break-out sessions are scheduled for discussion of the return-on-investment of usability and user studies.

Evaluating the economic impact of a design improvement through usability studies and prototype iteration, it might seem, would be a straightforward demonstration of the value of user studies. If appropriate metrics are determined, and if comparable data are collected before and after the redesign, one should be able to determine that there are fewer calls made to customer support after a design change than were made before, or that it took fewer mouse-clicks for people to find the information they were looking for, or that more visitors to a web site registered for that site or purchased something. But metrics such as these can be misleading in their apparent simplicity. While, relative to other design researchers, they operate under the most controlled of conditions, even usability analysts recognize that it is nearly impossible to isolate a design intervention as the only variable in before-and-after studies. What else could have changed at the same time and might at least share responsibility for transformations of user behavior or opinions: the launch of a new marketing campaign; a pool of users that skews toward returning visitors who have experience with the site; the institution of regulatory protections which decrease the perceived risk of identity theft, and therefore the risk of conducting online credit card transaction...?

And if it is difficult to demonstrate the direct economic value of a usability study, imagine trying to calculate the return-on-investment of exploratory, front-end user research. It is nearly impossible to isolate user involvement in a project as the only variable in a comparative study of design projects.

Furthermore, comparing the costs of investing in usability studies to the costs of providing support for customers who experience problems with product use is often times a disingenuous endeavor. Daniel Rosenberg, Vice President of Development for Usability at Oracle Corporation points out that companies do not bear the full cost of problems with products; users bear the bulk of the cost in frustration and loss of productivity. And as more companies charge for customer support services, users bear the real financial costs as well (Rosenberg, 2003).

In some measure, the economic value of conducting user studies is obvious, albeit difficult to quantify. Clearly it is cheaper to fix problems earlier in the product development process than later. It may be that the appropriate response to the question of return-on-investment of user studies is: Please rephrase the question. What would be the cost of not doing user research?

The ethical rationale for user studies is one championed by the participatory design community, with deep roots in the design of workplace environments and tools in Scandinavian countries. Judith Gregory (2003, 64) observes:

> **User participation in design is desirable for several reason with mixed motivations: 1) improving the knowledge upon which systems are built; 2) enabling people to develop realistic expectations and reducing resistance to change; and 3) increasing workplace democracy by giving the members of an organization the right to participate in decisions that are likely to affect their work. The first two rationales for user participation are not unique to Scandinavian participatory design; they are found in several system development approaches. It is the third motivation - the desire to increase workplace democracy – that is culturally and politically based in Scandinavia, in legislation and in participatory design approaches."**

This is a position that is almost unrecognizable from the American perspective of American industry. And, as Gregory makes clear, it is one that, even in Scandinavia, requires constant readjustment. While Scandinavian participatory design approaches continue to strive for democracy, structural changes in the global economy, in the values of corporations and trade unions and in the nature of networked resources complicate the project of workplace democracy and further limit its appeal as a rationale for conducting user studies.

Perhaps the most troubling demands for justification of user studies are those that come from other designers. They may not be as common as they once were; one does not often hear designers arguing *against* the value of user input. But they are not unheard of, and those from whom such demands may come tend to be in pursuit of a very practical rationale: Why would a designer do research? What do I need to know about users? What is it exactly that I should be trying to understand about them? And how is that going to help me design?

While we have number of responses at the ready, none seems convincing to designers who are reluctant to be convinced. We claim to be uncovering unarticulated needs. The unfortunate phrasing of that claim can make it hard to swallow, as one treads a slippery slope between recognizing an unarticulated need and creating a perceived need. If the need is unarticulated, is it really a need or is it simply an opportunity to make a product that will sell? We claim the value of user studies is in helping to identify user variables. But what are the right variables to look for? What is the significance of variations in cultural backgrounds, environments, language...? How can knowledge of these user attributes help with customizing designs for particular segments of the potential consumer population? We can safely, if ambiguously, declare that user studies are meant to inspire and inform design. But designers do not necessarily feel the need for inspiration from other people.

At the very least we should be able to convince the design community of the value of user studies. Whether we acknowledge it as a separate and distinct phase of the design process or as a specialized skill, all designers study situations of use. We struggle to program our VCRs; we attempt to read moving type on Flash-driven web sites; we try to work throughout the summer in modernist greenhouses. We see others doing the same. But where they complain, we criticize and imagine how it might be different. It is, after all, what makes us designers. But knowing one's own experience is not the same as understanding how others experience their worlds and value the material artifacts with which they are surrounded. Building that understanding is something that requires time and resources. When user research is not budgeted into a project, designers do it anyway; we do it on ourselves, on our co-workers, on our friends....

But the question remains: How do we convince designers of the value, the utility of user research? Why do we need to convince them of something that seems so obviously critical to successful design? What's the disconnect between user studies and design?

How do we convince designers of the value, the utility of user research? Why do we need to convince them of something that seems so obviously critical to successful design?

Making the Leap from User Studies to Design

Designers commonly find themselves working together with non-designers; it's not unusual for project teams to include both designers and social scientists or for a project contract to bring together two otherwise distinct groups: a user research team and a design team. Unfortunately, neither is it unusual for disagreements to arise in that situation between the designers and those conducting user research – disagreements concerning the role and value of the research, when and how it should be introduced to the team or to the client, and how, in general, the designers are to make use of research data. Researchers may accuse designers of "cherry-picking" through their data, responding to isolated bits of information while ignoring the larger findings. Researchers often may feel that designers jump to conclusions about users, proposing solutions to problems that were only hinted at, without having developed a full understanding of the user population.

Communication across disciplines can be problematic. Social and behavioral researchers may have difficulty understanding how designers are using their insights and findings. At the same time, designers generally have great difficulty articulating what part those findings play in the creative process of designing. This tension in the working relationships between user researchers and designers has been attributed to the "applicability gap" (Mitchell, 1993) – the space between user research meant to inform design and the actual creative processes of design. No matter which side of the gap you are standing on, all communication problems, it seems, stem from the other side's ignorance of what you do. So what do we need to do to bridge this gap?

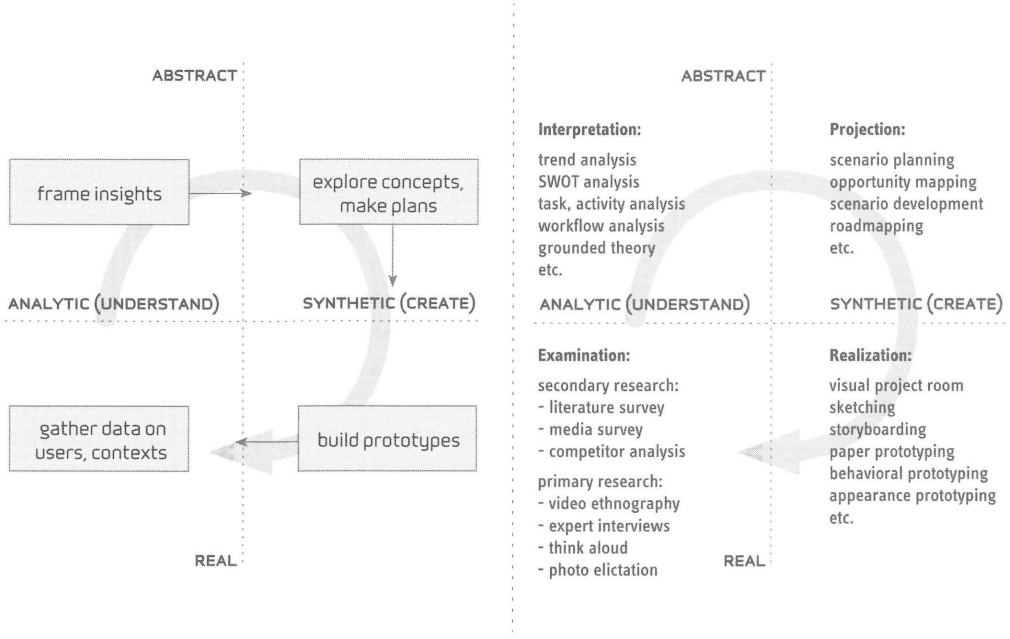
The applicability gap, it seems, is primarily a communication gap - a problem with aligning the intentions of user researchers with those of designers. What we lack is the ability to explain to our fellow designers the value of user research by making explicit its connection to the design process. Models of design process are, of course, many and varied, and, for the most part, of interest only to project managers concerned with resource allocation and stodgy professors of design methodology. In fact, as our symposium discussions wound down, the group attempted to link the issues which we identified as being pertinent to user studies (and which we decided would warrant their own chapters in any textbook on user studies) with corresponding phases of the design process (*see figure 1*). In the end, I must confess, I am not sure we were able to convey through this exercise the significance of user research in the activity of designing. Where our matrix of associations falls short, I believe, is in failing to convey any direct association of user research methods and data to *design thinking* processes.

FIGURE 2:

Here I must diverge only slightly from our symposium discussions to consider two different approaches to conceiving of design processes that make more readily apparent the role of user studies: one which considers design as an information-driven process and a second, related way that takes a more constructionist approach to understanding design activity as design thinking in action.

Figure 2: A modified version of Charles Owen's diagram of design process with methods mapped to it.

The first is through the work and ideas of Charles Owen and specifically through his versatile representation of design processes. The diagram reproduced here is one to which Owen has returned over the years to describe everything from the structure of the graduate design curriculum he helped develop (Owen, 1998) to the specialized planning functions which distinguish modern design practice from traditional craft (Owen, 1993). In 1997, a group of students used Owen's diagram to map the methods that were being taught and used in class projects at the time by designers at the Institute of Design. Those included not only prototyping and concept visualization techniques, but tools for analyzing the business environment within which a proposed design solution must survive and methods aimed at understanding users (Melican, 1997). Most recently, this structured description of design methods was used to present the methodologies associated with innovation planning. (Kumar, 2003)



Owen's model makes clear the distinction in design activity between abstract, mental work and work in the physical world of real stuff. It also distinguishes between modes of understanding and modes of creating. Using it to position design methods further clarifies their role in designing, and highlights the interdependencies of data gathering methods, interpretive approaches, conceptual representations, and prototyping techniques. In trying to understand the real world through empirical investigation, we employ methods of observing and interviewing users. This examination or data collection results in raw data. In interpreting those data, we develop analytic frameworks that capture pertinent insights. Still operating in the abstract, we may reconfigure the set of relationships we have understood to be present in the current situation to project a possible future state – a concept proposal or plan. It is through the realization of those concepts – making them real, as prototypes – and through their introduction into the real world that they can be scrutinized and evaluated for their fit within the intended context.

Design is an iterative process, an ongoing conversation that occurs between our minds – our imaginations, and the real world of stuff into which our designs will be introduced. Engaged in the activity of designing, we switch seamlessly between these modes of thought and action. It's a process that Donald Schön (1983) calls "back-talk": observing our domain of interest then modeling some aspect of that domain in a way that captures our understanding of it; sketching out an emerging concept or plan then stepping back to determine if our plan might achieve what we intend it to; studying a situation to identify project stakeholders then generating a diagram to communicate the possible relationships between them; building a working prototype that demonstrates our idea to teammates and potential users then putting it out there to determine how it performs in the real world.

The benefit of Owen's model is that it impresses upon us the distinction between, while implying the relationships between, techniques used for gathering data about users and the analytic tools we use to frame that data in potentially productive ways. It recognizes information structuring as an important component of design process – an essential skill to design thinking, and reminds us of what constitutes good analysis; the right analysis is the analysis that works, that moves you forward in the creative act.

Another way of thinking about how user studies provide useful information to designers is to look at designers – actual designers engaged in the act of designing – as they apply the information provided through user research in their creative problem solving processes. There have been a number of limited studies of user-informed design activity. They range from retrospective accounts presented as case studies to detailed analyses of the minute-by-minute proposals, considerations and decisions made by designers in action.

My own dissertation research was a study of the second sort; it was concerned with understanding how designers apply user research data in defining a problem space and in developing solution ideas. Through an empirical study (consisting of the observation and analysis of the activities of small teams working on a given design problem in a laboratory setting), I found that designers productively apply user research data in: 1) formulating the design task (bounding their problem space using the data available to them, as well as their personal knowledge); 2) identifying themes in the data – which are often formulated as pairs of opposing terms (problem definition / solution it suggests, or a solution proposal / problem it reveals); 3) finding structure in the data – that is, developing an organizing, conceptual structure to facilitate their framing of the design problem and generation of solutions to it; and 4) constructing models of user behaviors, including narrative scenarios of use based on the real-world stories in the data.

This description of user-centered designing is not inconsistent with Owen's model of design thinking. They both highlight the activity of finding structure in user data. Both position it as a *design* activity – a critical component of design thinking-in-action. And here I should emphasize two implications of this conception of creative, design problem solving. The first is that an analytic framework cannot be constructed in isolation from its synthetic counterpart. Or, to put it another way, the only understanding of user research data that matters in designing is an actionable understanding. An analysis that is conceived without the explicit or implicit goal of propositional reconfiguration, while it might just happen to be useful, is as likely to be useless. The coherency of a proposition or plan is related to the structure of the analytic framework, just as the analytic framework is dependent upon the type and quality of research data and the means by which is was collected. All of that is a complicated way of saying that when we interpret and analyze user data, we must do it as designers – as part of a design activity.

the only understanding of user research data that matters in designing is an actionable understanding

The second important implication of these descriptions of user-centered designing has to do with *how* designers develop actionable understandings of users and contexts of use. Those understandings bubble up, as organizational structures, *from* the data; interpretations are tried on for size, evaluated for their potential as design moves, and immediately cast off or modified in a dialog between the data and the designer's intent. There are lessons to be learned here – lessons we can apply as we consider the make-up and division of labor on design teams, and that we can apply as we develop methods and tools for the analysis and management of user research data. Rather than distribute the responsibilities of understanding and creating between two groups: user researchers and designers, we should consider them part of the same activity. Rather than imposing structure on user research data, we should take a cue from the social sciences' well-developed methods for qualitative data analysis – particularly from the techniques of grounded theory and activity theory (Gregory, 2000) – and work toward developing a sensitivity for discovering concepts in the data.

But bridging the applicability gap certainly can't be simply a matter of clarifying how designers think. The other half of the equation depends upon a clearer articulation of the methods and tools that researchers employ to gather and analyze user data.... What are their inputs and outputs? How do they function to support design thinking? As dissertations, as models, as case studies or examples of best practice, these methods and their applications need to be shared between practitioners and incorporated into our design curricula.

Sharing the Tools of the Trade

Despite a relatively long history of user studies in design, there has been little done in the way of cataloging research methods most commonly used to inform design processes, classifying them, or identifying those most suitable to the task. A 1980, government-sponsored survey of behavioral research methods used in architecture is one of the most complete catalogs (Rubin and Elder, 1980). Its presentation of environment-behavior research methods is structured according to the senses through which "the users of buildings experience th[o]se environments...": hearing, vision, and the olfactory sense, as well as tactile perceptions of temperature and movement.

A concise booklet prepared at the Royal College of Art's Helen Hamlyn Research Centre (in conjunction with a conference on designing for the special needs of the elderly) categorizes user research methods according to the resources each requires for implementation. In addition, methods are grouped according to their applicability to design projects in which research may be included toward different ends: those projects concerned with influencing the physical or purely visual qualities of a design, as compared with projects in which user research may play a part in determining a product's functional specifications (Aldersey-Williams et al., 1999).

The task of classifying user research methods is complicated by a tendency on the part of design consultants to "invent" their own proprietary research methods. While one could try to list the many user research methods that design firms claim to have incorporated into their work processes, a good number of those methods would employ similar techniques toward very similar ends. On lists of user research methods we find references to techniques such as: "guerrilla ethnography," "physical trails," "live in the future," "cultural probes,"....

While it may serve to impress clients and differentiate a consultant from his or her competitors, such idiosyncratic re-naming of what are essentially standard (if creatively adapted) research techniques, does a disservice to the field as a whole. Teaching user research methods to designers is made difficult enough by corporate policies on intellectual property which keep the most interesting and developed case studies of research application out of public circulation. Obscuring the nature and origin of useful research technique just adds to the confusion. That is not to disparage those who engage in creative adaptation of research methods...as long as they are clear on which familiar tune they are riffing.

There have been attempts made to sort out the mess that is design research methods. In a 1992 article written for the Design Management Journal, Liz Sanders characterizes product development research methodologies as falling into five general categories: observation, classification, conversation, description and participation (Sanders, 1992). Sanders stresses that these approaches or "perspectives" are, in practice, complementary, and that designers (or design teams) should use them together in combination in order to arrive at a truly well-rounded view of the context of use. Her classification scheme is insightful and helps her to make her point – a well warranted warning against relying too heavily on one approach to understanding users. Moreover, it begins to get at a *basic* typology of design research methods – one that cuts through the haze of proprietary distinctions to expose the common building blocks of research technique. Most recently the consulting firm IDEO has produced a deck of cards, each of which describes a technique that the firm employs "to empathize with users." Following Sanders, they categorize their research techniques according to four basic methodological "suits": Learn, Look, Ask and Try. IDEO encourages other practitioners to try the methods they have found useful, declaring, "Our techniques are not proprietary and have been adapted from various established human and social research methods."

Summary

I will conclude on an upbeat note, as did our discussions. User studies, it seems, is maturing as a (sub-) discipline in a way that builds on and extends its cross-disciplinary bonds. It certainly faces challenges in finding a place in design practice and education. But, whether or not design practice and education find a place for user studies, the interdisciplinary cross-fertilization that has been set in motion will inevitably lead to exciting new breeds of creative practice.

| ACKNOWLEDGEMENTS |

As the sole contributor charged with summarizing two days worth of rich conversation and debate on all matters relating to the study and practice of user studies in design, I should first apologize to my colleagues for any perceived omissions or unwarranted emphasis they may find in my report of our discussions, which I recall through the filter of my own personal interests and opinions. Moreover, I must acknowledge and thank them for their substantial contributions to the thoughts outlined above. Over the course of two days our user studies discussion group was treated to presentations that were largely case studies: Design and Risk Management in Different Cultural Backgrounds, Kok-Hin Terry Chan and Pierre-Henri Dejean; Mental Models Readers Develop while Navigating in the Web Environment, Maria Gonzalez de Cosio; Two Contrasting Cases in User-centered Design, Judith Gregory; Korean Modern Wall Painting, Jo Hyunshin; Participation - The Human Paradigm, Dirk Knemeyer; User Insights Knowledgebase, Vijay Kumar; Development of Design-support System for User Research, Kun-Pyo Lee; Design Process for Innovation Using Shadowing and User Models: A Samsung Project, Aaron Marcus; Conversations with Users, David Sless; Wrangling Contexts: Influences and Domains, Eric Swanson; Project F - A Look to the Future through User-centered Methods, Jan-Christoph Zoels; and my own contribution, Design Ethnography to Inform Next Generation Communication Technologies, Jay Melican. Responding to those papers and offering their own perspectives on user studies were Leif Allmendinger, Suzan Boztepe, Roman Duszek, Jorge Frascara, Maria Giudice, Ronald Hofer, Gøsta Knudsen, Tore Kristensen, Judith Moldenhauer, Christena Nippert-Eng, Guillermina Noël-Frascara, Alain Rochon, Karel van der Waarde, and Dietmar Winkler.

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Where are the Design Methodologists?

COLLABORATION

USER STUDIES

DESIGN RESEARCH

Methods are not mysterious.
They are beneficial to the growth of a discipline.

DESIGN METHODS

The purpose of practice is to address a specific design problem.
The result of practice is a completed project, a design.

WHERE ARE THE **DESIGN METHODOLOGISTS**?

CHRIS CONLEY

ABSTRACT:

Methods still attract both confusion and dissension in design. "Design" and "method" are defined in order to carefully locate meaning in the following discussion. A brief reflection on the history of design methods, precedes reasons for supporting this investigation and reasons resistant to such work. An analogy is drawn to other domains such as thermodynamics, now thoroughly established with a useful body of knowledge, that originally suffered from the resistance of practitioners to codification of knowledge about the domain. An anatomy of method is offered that describes its key features and indicates possible areas for generation of new or improved method, given the changing context of design performance. The essay argues that developing methods that are explicit, useful and whose efficacy can be measured is essential for the development of design as a discipline.

Do you know one? A design methodologist, I mean. You know, a professional or academic who is concerned with how design is done in addition to doing design. Do you know of anyone who makes a conscious act to select a particular approach to working through a design problem? By this time in the development of the discipline, most designers should have a thorough education in design methods and apply them regularly in practice. There were a good number of methodologists in the 1960's representing numerous design disciplines including architecture, product design, city planning and others. Yet, the discussion at the 2003 2byTwo Conference gave the impression that design methodology is still just emerging or at least that it remains on the periphery of academia and practice. Have design methods skipped a generation? Has the postmodern backlash to modernism submerged methods along with high modern expression? Has technological support for design processes cheapened thinking? Attendees in the conference session on methods were there to present their current experiments with methods, how they taught methodology and to just see what was going on in design methods today. For someone who has been immersed in the development, practice and rhetoric of design methods for over fifteen years, the state of affairs, as much as it could be characterized by the interactions at the 2byTwo symposium, was certainly striking.

In this paper, I attempt to explore why design methods seem to remain a contested possibility in the field. I draw on some history, look critically at the culture of design and seek analogies from other fields. My ultimate goal is to break down some of the apparent barriers and misconceptions about design methods and sketch out potential ways of encouraging their development and adoption as a normal part of design research and practice.

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Definitions

There are two important definitions with which to begin. They are "design" and "method." I use the term "design" in this paper in much the same way as Herbert Simon who I paraphrase here: "Design is devising courses of action aimed at turning existing situations into preferred ones" (Simon, 1996). Design, as it is used herein, is intentionally broad and encompasses any discipline whose goal is to create new artifacts and systems. The particular fields of design that are normally implied by the attendees of the 2byTwo symposium and perhaps by readers of *Visible Language* are design fields generally interested in visual solutions that mediate the relationship between artifact and human user: communication design, information design and industrial design. Throughout the paper, the term "human-centered design" or HCD will be used when referring to the fields of communication, graphic, product and environmental design. Design will be used in its much broader sense.

The definition for "method" is: "A means or manner of procedure, especially a regular and systematic way of accomplishing something." Methodology means: "A body of practices, procedures and rules used by those who work in a discipline or engage in an inquiry; a set of working methods" (American Heritage® Dictionary, 2002).

"Design is devising courses of action aimed at turning existing situations into preferred ones"

(Simon, 1996)

So "design methods" would be concerned with the body of practices and procedures that designers regularly use to turn existing situations into preferred ones. Said in this way, design methods seem concrete and downright necessary. It doesn't seem as if it is open to debate as to whether design methods exist or not. They exist by definition because designers have regular and systematic ways of accomplishing what they do. What is open to debate is whether we know much about those practices. Are HCD methods studied, documented, shared and published? They certainly were in the late 60's and early 70's. And they are today, but not nearly in the scale that is probably necessary to grow the HCD discipline at a healthy pace. Human centered designers remain highly skeptical of methodology. This is due partly to deeply held beliefs as well as lack of knowledge and understanding about what methodology is and can bring to a discipline.

Dead or Alive?

One can barely think of HCD methods without thinking about the design methods movement in the 60's and 70's. Significant practitioners and researchers included John Chris Jones, Christopher Alexander, Geoffrey Broadbent, Bruce Archer, and A. D. Hall. The Design Methods Group, founded in 1966 in Canada by Gary Moore, then an architecture student at UC Berkeley, and Marvin Manheim at MIT contributed to this movement. Throughout the late sixties and early seventies this movement's rise and fall and long-lasting negative perceptions among the human-centered design community may be one reason methods remains on the periphery. The leaders of this movement contributed theory, methods and example applications of methods for design. *Notes on the Synthesis of Form* (Alexander, 1970) and *Design Methods* (Jones, 1992) stand as seminal works.

This era of methods development seems to have gained too much momentum on the promise of computational and algorithmic solutions to complex design problems. Similar to our recently experienced boom and bust economy of ideas and businesses based on the Internet, the excitement of a new class of technology inflated the claims, goals and expectations of design methods and what they could help mankind achieve. In his preface to the second edition of *Design Methods*, C. Thomas Mitchell writes:

> **Though design methods became for a time a popular subject, the movement did not have the effects Jones had hoped for. Some of those who adopted the new methods took design to be a completely rational, explicable process and used the methods as pretext for excluding intuition all together (Jones, 1992, xi).**

Jones continues,

> **We sought to be open-minded, to make design processes that would be more sensitive to life than were the professional practices at the time. But the result was rigidity: a fixing of aims and methods to produce designs that everyone now feels to be insensitive to human needs. Another result was that design methods became more theoretical and many of those drawn to the subject turned it into the academic study of methods (methodology) instead of trying to design things better (1992, xi).**

It is a well-known result of this emphasis on algorithmic design methods that both Jones and Alexander rejected their early work and began exploring more intuitive and human-oriented approaches to design. This was not a rejection of design methods per se, as many will argue, but a rejection of deterministic searches facilitated by computation. It is worth asking what the evolution of design methods would have been if this early era had not been intermingled with the emergence of computing. Certainly, operations research, whose interest is the application of advanced analytical techniques to help make better decisions and to solve problems, benefited tremendously from the design methods movement and the association with computation.

In spite of this well-known failure of new methods for HCD, are there other design methods that have emerged that are more aligned with actual HCD practice? Actually, the contemporary landscape of design methods is alive and well if one adjusts their viewpoint to include the broader definition of design mentioned earlier. While perhaps not spawning directly from the work of the early methodologists, design methods are being developed, published and taught in a variety of fields. There are methods for assessing user needs, establishing requirements, evaluating concepts and designing new products and services. A significant number of methods have been developed by the human computer interaction community, including the cognitive walk-through, heuristic evaluation and low-fidelity prototyping. In design engineering, there is Quality Function Deployment (QFD), Theory of Inventive Problem Solving (TRIZ) and the Design Structure Matrix (DSM). Design for Six Sigma (DFSS) is establishing momentum, which is a collection of the methods above, whose aim is to ensure robust and reliable design and development processes.

Many of these methods are based in disciplines far more comfortable with the role of science, math and engineering than the visual, human-centered design disciplines. But one cannot deny that the goals and problems these methods are attempting to address coincide with goals and problems of HCD. A common theme throughout the literature evaluating these methods cites the lack of understanding available from the sciences and engineering in helping to address real-world design problems. However, all of the methods cited above, and there are many more, benefit from a community of professionals and academics who vigorously pursue their development. Does the community of HCD lack the shared background, understanding and critical mass to research and develop new HCD methods?

Methods, theory and the development of a discipline

The term "method" is often associated with other concepts equally questioned and critiqued by the HCD community as to their value; theory, research and the scientific approach. Are methods an attempt to make HCD more scientific, more rational? Are methods only useful for the kind of design that includes research? Can methods really be employed to be a more effective communication designer?

Anyone interested in these questions and indeed theory, method, tool and principle are concerned with the state of the design discipline overall. Professor Emeritus Charles Owen of the Institute of Design argues that the development of methods, basic principles and theory are at the foundation of any formalized discipline (Owen, 1990). A formalized discipline is one that has a body of knowledge that is explicit, can be critically assessed and built upon. Without a body of knowledge an area of practice is considered a craft. Within craft traditions, there is little shared knowledge about how and why things are the way they are. There is considerable knowledge, however, and it exists inside the craftsperson's head and it is embodied in the resulting work. To maintain this knowledge, masters train apprentices in the craft.

A field emerges from a craft as knowledge is externalized, shared, evaluated and refined. Knowledge expands from what is done to why it is done. With a growing body of knowledge, more questions are asked, more research conducted to answer those questions and more understanding developed. Theoretically, this allows the discipline to expand into new areas of inquiry, new applications and more reliable practice.

A field or body of knowledge is built, verified and changed through the activity of research and publication. HCD as a discipline has a relatively small body of knowledge due to its limited tradition in research. One will find that in many other disciplines there are one or more "research traditions." A research tradition often has one or more founding figures whose original theory, methods and results form the basis of an ongoing line of inquiry.

Without a strong research tradition, HCD has had trouble building a critical mass of academics and researchers who reference and build upon a base of knowledge. HCD seems challenged as a discipline to study itself and its applications in order to build knowledge about itself. A recurring discourse in design is whether the practice of design itself can be considered research. This doesn't make sense since practice, or the doing of design, has completely different aims than the study of design. Certainly practice can be studied to form the basis of data collection in a particular research project, but in this case, the researcher and practitioner remain separate entities. And they have different goals.

The purpose of practice is to address a specific design problem. The result of practice is a completed project, a design. While one may add to one's personal knowledge and experience, there is no building of the discipline's knowledge through practice. Books about design practice are picture books, cataloging the many individual results of design practice. The purpose of design research is to develop knowledge. The result of design research is theory, principles and methods. They are generalized so they can be applied to multiple situations, multiple design problems. This is how other disciplines work. It is how the design discipline should work.

The purpose of practice is to address a specific design problem. The result of practice is a completed project, a design.

Why has HCD taken so long to begin building knowledge? Why is it still debated whether knowledge building in HCD is possible or desirable? Actually, this pattern is common to all fields – what begins as craft, evolves into professional practice and finally begins to develop a field. It seems that HCD, however, has held out for quite a long time. Marketing, computing and human computer interaction – all are contemporaries to HCD. Each of these fields has roughly a fifty to seventy-five year history or less. Each of these other areas has evolved into full-fledged fields supported by a community of practitioners, researchers and university programs. Journals, conferences and research consortia exist not only for the topic overall, but any number of sub-topics and specialties. In HCD, by contrast, there are few scholarly journals, Ph.D. programs or vibrant sub-topics of research and development.

All fields must go through this evolution, starting as nothing more than practice and eventually enjoying full-fledged academic and practitioner communities. Early in the history of many fields, practitioners have resisted this evolution because it is never clear that it is possible to know about how things work. It is argued that understanding the complexity or subtlety of the field is impossible or would not prove to be useful. Thermodynamics, the branch of physics that deals with the characteristics and dynamics of heat, is the latest field for which I have found this pattern recounted in *The Principles of Design* (Suh, 1990). Suh developed an approach to mechanical design based on axioms and presents it in this work. Axioms are general statements that cannot be proven, but for which there exists no counter examples. Newton's laws of motion are axioms. In the introduction to his book, Suh makes a compelling case for how knowledge must be built in any field if it is to perform beyond what craft practice allows. Knowledge, grounded and developed from research, opens up new vistas of exploration and application. It makes a field more vibrant, creative and useful.

> In many fields of science, empiricism and technological needs have always preceded the development of the science base, ranging from mathematics (von Neumann, 1961) to thermodynamics. This is best illustrated by examining the development of steam engines as a technological solution to meet a specific societal need, and the subsequent research work that led to thermodynamics as a scientific discipline. From the early to mid-nineteenth century, there were many attempts to develop steam engines. In those days, the axioms of thermodynamics were not established and designers therefore had to try many different ideas without the benefit of thermodynamics. Each inventor developed various engines by trial and error, and claimed that these engines were better than the rest. There was no way of distinguishing the advantages of one design over another without actually building the system and testing it (Suh, 1990, 15).

The similarities should be apparent to current claims in HCD about ease-of-use or better performing interfaces. What are the fundamental principles that underlie interaction? How do we characterize and measure interactive qualities? What are viable ways of assessing performance and comparing potential solutions? These are just a few of the many hundreds of relevant questions that should be asked and researched in the HCD community. Research produces knowledge. This knowledge would not seem mysterious or irrelevant, but useful. It would result in the wider use of HCD across industry as the benefits and value of the discipline became clear. The reliability of design activity would increase.

Suh continues:

> This chaotic method for developing energy-conversion devices might have persisted to this day had it not been for the conceptual contributions made by Carnot and Joule during the latter part of the nineteenth century. They proposed the underlying fundamental processes involved in steam engines...These principles established the concept of energy and entropy in a fundamental sense, and provided the tools with which to eliminate perpetual-motion machines from consideration at the design stage...These laws largely eliminated unfruitful arguments over the merits of many energy-conversion devices through the establishment of a theoretical base (1990, 15).
>
> Another example of the technology-driven field that led to the science base is the communication field. The need to communicate led to the invention of telephones, which in turn led to an information theory, which has had profound impacts on many other technologies (1990, 15).

Where would we be if medicine, biology, social science and psychology all maintained the belief that research and development of knowledge and new methods for practice in these areas would not be useful?

Methods are not mysterious.
They are beneficial to the growth of a discipline.

Anatomy of a design method

Methods are not mysterious. They are beneficial to the growth of a discipline. They do not eliminate the need for design expertise, but rather extend it. Let's shift our focus to methods per se. Of what do methods consist? Recall the definition we started with earlier: "A means or manner of procedure, especially a regular and systematic way of accomplishing something." This definition of a method focuses our attention on the procedural aspects of a method but it doesn't really help us decompose other descriptive dimensions. These other dimensions demonstrate that the elements and architecture of design methods is far richer than a simple procedure. The quality and scope of each of these dimensions of design methods also remain to be explored.

Stage of the design process

The design process provides the first organizing scheme for methods. A design method exists to support one or more of the design process steps generalized here as: 1) understand the situation; 2) structure criteria; 3) explore alternatives; 4) evaluate and refine concepts; and 5) execute the design. This 5-stage design process can be considered a general purpose method in of itself. Many design teams operate from less structure, often taking the problem as described, ideating and presenting concepts. Calling out the need for understanding and structuring the criteria of a problem leads to a more considered design process and a higher quality result.

Each of the phases of the general design process described above provides a large area in which to create and apply new design methods. For example, a method such as ethnographic interviewing (Spradley, 1979) applies to the first two stages where understanding of a user's context can provide essential insight and new criteria for design. Paper prototyping (Snyder, 2003) applies to phases three and four and is an emerging method for embodying design ideas quickly to better understand interactive relationships. So it can be reasoned that any given design method may apply to one or more phases of the overall design process. Conversely, each particular phase of the design process provides a broad landscape in which new methods can be created to improve the quality of results.

Goal in using the method

A design method exists to augment our capabilities and to help the design team move from an initial state to a more desired state. A design method should make its purpose and potential benefits clear through the articulation of its goal. Often, the goal of a method is limited in comparison to the goal of the design program overall. The general goal of "a better design" does not provide enough detail to guide application of a method. A cognitive walkthrough (Dix, et al., 1993), for example, is used to quickly develop a large number of considerations during the development of an interface. The method is used to generate far more considerations than an individual could do alone. Its goal does not include evaluation and resolution of all issues identified. The goal of many HCD design methods often claim or propose too broad of a goal. By narrowing the focus and fostering a better understanding of the mechanisms at play, a deeper understanding can develop. This deeper understanding can then lead to general principles applicable across design projects.

One example of this is show-and-tell interviewing. A show-and-tell interview is a specific kind of ethnographic interview, which in turn, is a specific method within user-centered research. Show-and-tell interviewing requires the participant to show and tell the interviewer about the things they have at hand and what role they play in their daily activities. This particular focus on showing and telling led to the development of the concept of "invenstories," highlighting the value of the particular stories people tell while they are accounting for the artifacts that exist in their environment. Invenstories have since been used to elicit stories about a wide range of particular artifacts like wallets, office desks and garages.

Activities or steps

The activities of the method and how they unfold are the most common aspects of a method that are described. Activities are the meat of the design method – what is actually done as work. There are activities to prepare for the method, to conduct the method and to create results. The order of activities can be described such as those that are sequenced, concurrent and iterative. General parameters can be given for conducting an activity such as how long it should take, who is involved and the objective of that particular step. Generally, steps in a design method can be thought of as analytic or synthetic, convergent or divergent. But there is no need to make these mutually exclusive. Sometimes the creation of a large number of ideas and their immediate evaluation to select one or two is necessary. The collection of data or information can be thought of as a divergent process since the goal is to develop a body of content that can then be analyzed. Analytic processes include such things as evaluating concepts or searching for patterns in data. This is a simple, but limited example of how we can start describing the activities that comprise design methods to better understand them. A typology of activities in design methodology would be a helpful research project which would improve our understanding of design methodology per se.

People and roles

It is surprising how few methods make mention of the skills required of participants in the method and the roles they will play. A method does not guarantee that anyone can do it or that everyone in the group will play a similar role. Perhaps leaving out desired characteristics of the people executing a method drove some of the humanity out of the process. Certainly a lack of organizational structure among the participants in a method can leave the individual's purpose and contribution ambiguous at every step. Even a very simple method like brainstorming calls for a facilitator who must play a defined role in order for the quality of the method to be maintained. The need for clarity should be apparent regarding how people participate for methods that involve multiple steps and multiple people with different backgrounds.

Content or subject matter of the method

Methods work with the content of the design problem. Example content is the activity that the users of the new design engage in, components of the design itself and technical data. The content of a method is not, however, just that which is related to the design itself. There is content that is developed to execute the method, content generated by application of the method and content that results from the method. A topic guide for a behavioral interview is an example of content that needs to be created for the method. Alternative mockups are an example of content created during the methods application. A recommended set of criteria could be the result of successfully applying the criteria. Any given content might perform different roles depending on the stage of design. The content that results from an earlier method might be the content used to perform another method.

A particular advantage designers have in applying methods is that they can represent content in more effective ways than others. A well-designed diagram, using variables of the visual field to encode relevant information, can greatly improve a team's ability to identify and discuss relevant issues. A more clearly designed questionnaire can improve response rates and the quality of the information received.

Principles and conditions of application

Principles and conditions of application help methods retain their relevance despite a changing application context. The "Comments" section that Jones included in *Design Methods* is a good example of this dimension. "Difficulties in using this procedure are..." (1992, 328). Principles tell us something useful about the relationship between the abstract representation of the method (its description) and what tends to happen in use as its activities are actually played out. Again taking brainstorming as an example, it is known from its frequent application, that one-hour is somewhat of an upper limit for productivity. A brainstorm tends to digress into conversation after this time period because of the intense mental energy needed to ideate, listen and respond. In addition, many brainstorms start out slowly, increase in tempo and then die down. Understanding this simple pattern helps the facilitator and the participants to execute the method. Without this understanding, suggestions from the group often arise for what should be done differently because there is ten minutes of relatively little idea production at the beginning of a brainstorm. This can be systematically avoided when one can explain the method and facilitate its successful implementation. Finally, principles and conditions of use can be developed for different domains of application. Certainly systems furniture presents different challenges than medical devices at numerous levels. A designer building their expertise in a certain domain has the potential to deepen and refine the application of general methods for that specific domain, increasing the quality and value of their work.

All of the above dimensions demonstrate the richness with which design methods can be developed. Methods are not sterile algorithms that process design data and produce an answer. Methods are approaches to design problem solving, applied in specific contexts that provide reliable and transferable results. A design methodologist is a designer with all the same responsibilities as a designer of communications or products. She must understand the context of the method, be sensitive to the needs of the people applying it, successfully organize the elements of the method and seek to understand issues that arise in its implementation. Design methods can and should be as satisfying to design as a communication system, an airport terminal or a garden tool.

The purpose and value of methods

It was mentioned earlier that a method is used to augment the capabilities of the designer. Methods serve other purposes as well. They expand the kinds of problems to which design can provide value. Methods are necessarily general – they can apply to a wide variety of content. As a designer is faced with a problem with which she has little experience, methods provide a means to bridge prior experience to the new problem. I recently completed the mentoring of several student interns on a project to understand the effectiveness of some new furniture components. While never having done an evaluation of contract furniture, my methods of establishing target questions, observing and engaging users as well as data analysis and the development of implications for other kinds of products served as the foundation for this work. There are limits, of course, and no method can make up for experience with the specific content of a particular context.

Methods improve the pedagogy of design. When "regular and systematic ways" of designing are documented, the design instructor has a structure and approach to teaching. The Swiss school of graphic design was known for its range of visual exercises which provided rigorous training (Diethelm, 1982; Hiebert, 1998). Each of the exercises addresses a kind of visual problem, such as hierarchy, contrast or rhythm. Collectively, these exercises provide a pedagogical methodology that improves the quality of the designer that completes this training. Without this or another methodological structure, students randomly try visual solutions to random design briefs or emulate solutions they find interesting. While enough of this kind of experience will certainly train a competent graphic designer, their skills and knowledge will remain a craft – they'll know what works but not necessarily why. Furthermore, they will have trouble solving different design problems with which they have little experience.

Methods improve communication about the purpose and value of design itself. Not at all a false assurance, the ability to articulate specific steps in a design project, expected results and resources required helps designers work with other professions unfamiliar with the design process. Most professions have a structure under which they work. Some professions such as market research require explicit explanation of the methodology used as a form of evaluation of quality and appropriateness. Improving communication can also lead to better collaboration among different design teams working on the same project. Sharing a model for how the work can proceed allows collaborators to more quickly contribute to the problem at hand.

Methods improve communication about the purpose and value of design itself

Methods deepen the designer's knowledge and understanding of their field. With a structure within which to work, a practitioner may more easily reflect on and compare experiences between cases. This reflection and review of work can result in new insights about one's practice. In academia, a growing body of methods allows specific studies to be conducted to deepen and extend existing methods and to invent completely new ones. A research community, sharing results of work with other academics as well as practitioners, builds the momentum necessary for continual advancement. Journals, conferences and academic programs grow and extend the design field. This community is growing rapidly in Asia where a Ph.D. in order to teach is now required in the leading universities with design programs. While an argument can be made that in the short term qualified candidates will be overlooked, it is difficult to argue that it is not beneficial

Summary

that the Ph.D. become the terminal degree in design. Design activity does not have to remain a craft-based activity. It does not need to be portrayed as a mysterious search for insight or involved with inexplicable creative leaps as the literature and popular press so often describe. Design is a discipline that should enjoy a community of practitioners, academics and students that work on building its base of knowledge. Core to this base is the development and evolution of design methods. There may be significant cultural barriers within design that has kept it from growing its base of knowledge more rapidly. That methodology removes the creative aspect of design and an emphasis on doing design over understanding how it works are two of the more significant misunderstandings. The essay on Collaboration in this issue also underscores the need for explicit method when inter- and multi-disciplinary teams address problems and need to negotiate process. The argument for design methods just presented puts into context the prospect and need for method in design from both a disciplinary and practice oriented perspective.

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DESIGN RESEARCH

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Perspectives of Design Research: Collective Views for Forming the Foundation of Design Research

COLLABORATION

USER STUDIES

DESIGN METHODS

Design research often uses combinations of different types of data acquisition, analyses and inquiry methods to supplement the limitations of each method.

DESIGN RESEARCH

The discussion raised issues such as the positioning of computer-supported methods in different design activities and balancing between automated processes and designer's decisions.

PERSPECTIVES OF **DESIGN RESEARCH:** IN DESIGN

Collective views for forming the foundation of design research

KEIICHI SATO

ABSTRACT:

Based on a wide-ranging discussion of design research that sought to establish its nature, controversies and types, this paper uncovers some ongoing difficulties in understanding ways to structure and communicate about variations in design research. Two basic types of design research are defined in order to establish greater clarity for what follows: research that advances design project development — this is particular in its nature; and research that provides theory, principle, method or tool — this is academic and more general in its nature. The discussion stresses the second area of research. Participants brought in research cases to anchor the discussion; these are presented as snapshots and are referred to in the larger discussion. Also Ph.D. dissertation models are presented as yet another way to define research variation. The paper concludes with unresolved issues that impede access and use of research.

"What is Design Research?" was the general question throughout the two-day meeting to discuss "Design Research." The intention of the session was to explore the nature of design research from different viewpoints and derive models of design research that the design community can share as a foundation for further development of research practice and advanced education.

Research in design has a short history – it would be safe to say it is no longer than fifty years. This history might be relatively long compared with some new research areas that emerged from established areas of science and engineering. The difference between those areas and design research comes from the degree of inheritance from existing models of research. New research areas usually inherit basic resources to establish their own system from related areas of research. Research in design, on the other hand, does not have much default asset inherited from other areas. There have even been skeptical views about the legitimacy and usefulness of developing design research in the sense other areas of research exist as a system of scientific inquiry or an intellectual foundation for practical pursuit. The skepticism relates to several reasons. One is the diversity of the areas and cross-domain nature of its concern, since design is a practice that deals with diverse types of artifacts. Another is the complexity of human cognition involved in various aspects of design. For example, to understand design practice itself requires one to know how designers understand and solve problems through their manipulation of information. Design as a discipline responsible for the interface between people and technologies needs to deal with various aspects of human behavior as the main entity, such aspects as cognitive, emotional, cultural, social and organizational factors. Since most knowledge in these domains remains underdeveloped in comparison to science and engineering, research in design suffers from a fundamental difficulty with regard to its origin. Yet, the mission of this symposium is specifically to nurture an optimistic and constructive community of design research through self-critical discussion and collaboration.

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Before we start our argument on the nature of research in design, it is necessary to distinguish two types of so-called "design research." Without this distinction, as historically experienced, our discussion will be confused and obscure in our attempt to view a wide range of research cases. One use of the term "design research" is the practice of developing information for a particular design project. Here, we use the term "research" in the same way as market research or user research as an activity intended to develop understanding about the domain of concern that includes user needs, social issues, markets, competitive products and related technologies. The other indicates the practice of developing a generalized body or system of knowledge commonly applicable across different cases and commonly validated or agreed to by general academic standard. Types of knowledge that are expected to be developed in this class of activities include theories, methods, principles and tools that become resources for future cycles of developing knowledge or for applications in practical use. In this article, we focus on the latter case, academic design research even though some of the activities are common across both types of "design research."

This article first reviews the presentations in the session that brought a wide range of research cases for discussion, then searches for dimensions of design research that define different research models. It also describes procedural models used for Ph.D. dissertation research at the Institute of Design, IIT, and finally raises some issues that need further examination and discussion among both design research and practice communities.

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Design research cases: reflective views of research practice

The research cases presented in the session showed diverse approaches and domains of concern addressing different issues and dimensions of design research. It built a rich resource for the discussion. The brief descriptions below are not an accurate summary of the presentations. They are snapshots captured from the lists of focus points reflectively created by the presenters and participants for individual presentations.

Typographic rules:

Karel van der Waarde stated that graphic design knowledge was poorly recorded in a readily usable form of design rules and that experimental research data is not sufficiently archived for practical use. The discussion pointed out the difficulty of accessing research data and its possible irrelevance to the practice. The controversy exists between the specificity of research data and comprehensiveness of the quality expected in design that cannot be addressed by individual typographic parameters.

Understanding how design becomes a strategic medium back-stage and front-stage:

Birgit Jevnaker argued the necessity of multiple perspectives on design research not only looking into design practice but also business practice. She introduced the concept of thick and thin boundaries to position and understand design practice. In order to enhance knowledge transfer across disciplinary boundaries, the discussion pointed out the need for design to develop a means of communicating and accumulating knowledge beyond tangible design output.

Design research cases

Metadata:

Jimmy Peng introduced four categories of activities that frame design knowledge management: 1) create, 2) record and capture, 3) modify and classify, and 4) share. His research uses education as a model case for knowledge management applications to research and practice and attempts to identify design specific metadata for constructing a design knowledge-base. Questions were raised about the relation between advanced system development and research and about evaluation of research output.

Opportunities and barriers for building experimental research in communication design, behavioral intervention research in health:

Zoe Strickler explained that multi-disciplinary research environments such as Health Behavioral Intervention Research raise the standard of design research by introducing the rigor of measuring its effects to the outcome of the project. She also emphasized the value of Ph.D. programs in design to enhance credibility of design research and to extend funding opportunities. The question was how we evaluate the benefit of design research output. Her case project exemplified an experimental research model in design.

Innovation landscapes:

Tore Kristensen presented an example of the critical roles design plays in the business environment. Bringing metaphor to media for communication and thinking within innovation processes are effective forms of design contribution to business. The discussion questioned what this implied for individual, team and organizational work regarding context.

Designing with evolving systems:

John Broadbent emphasized the importance of collaborative reflection in design based on his insight into the epistemology of the science of chaos – holistic science. He pointed out that recent exponential changes of technology requires design to shift its approach from evolutionary consciousness to conscious evolution. Reductionism vs. holism then, became a focus of discussion questioning, whether they are exclusive alternatives or complementary partners.

Textual-visual analysis:

Leong K. Chan discussed the importance of designer-client-user relationship and contextual factors in analyzing the effectiveness of a proposed design. The discussion also pointed out the importance of incorporating historical changes or time factors into the analytical view of design research. Another discussion focus was on the need for methods that can bridge between macroscopic factors in large-scale social problems and microscopic factors of individual user experience such as cognition and emotion.

Developing information framework:

Youn-Kyung Lim presented the model of her dissertation research for developing design information framework (DIF) to bridge different activities, viewpoints and information representation formats (Lim & Sato, 2001). She explained that different output expectations require different research models. Theory and methodology oriented research tend to be abstract thus eliminating compelling stories that focus on user needs. For this reason, she proposed DIF with the capability to construct tools for generating scenarios and specifying prototype models for intuitive access to design problems and proposals (Lim & Sato, 2003).

Defining the use of color in graphic design:

Sylvie Pouliot discussed needs for developing and breaking empirical cycles of color education in graphic design. The difficulty is to create a connection between practice and general color theories, because color semantics and color

effects in relation to people are highly context dependent. The question is whether it is possible to develop principles and guidelines flexible enough to adapt to practical cases.

Developing research into human-centered product architecture:

Adriano Galvao introduced his Ph.D. dissertation research that intends to develop the concept and methodology of human-centered product architecture. This research extends the existing methods of product architecture to incorporate the structure of user interactions and to respond to the change of use context (Swanson, Galvao & Sato, 2003). The discussion suggested that mutual influences between product architecture and user experience would be an important subject for investigation.

Formal style determinants:

Kuohsiang Chen pointed out that not much research has been done in the area of user's psychological preferences. He explained that computer-supported methods effectively assist design to incorporate user's preference patterns such as psychological response to formal features. The discussion raised issues such as the positioning of computer-supported methods in different design activities and balancing between automated processes and designer's decisions.

The discussion raised issues such as the positioning of computer-supported methods in different design activities and balancing between automated processes and designer's decisions.

Dimensions of design research methods

There are some very basic dimensions that characterize different research models; these can be used as landmarks for positioning, interpreting and constructing specific research projects. The dimensions include: general to domain-specific, inductive to deductive, qualitative to quantitative and variable to specific or case-specific. Another way of characterizing design research is to categorize it into theoretical, methodological and empirical/experimental. Different research questions set different goals, different courses of actions and different outputs. Understanding these differences is important for forming appropriate research programs that develop scientifically valid, consistent and complete research actions and outputs.

General design research versus domain-specific design research

Research in general theory of design

The process of design starts with a given information describing situations, problems, goals, requirements, etc. and ends with sufficient specification to implement an artifact. Through this process, designers carry out knowledge operations such as translation, generation and validation. The nature of this generalized process model and basic categories of knowledge used in the process such as attributes and functions are common throughout all disciplines involved in the creation of artifacts. Research in general theory of design, as defined here, is scientific acts to reveal the general structure of design as cognitive and social processes of people, groups and organizations. Clear distinction must be made between what theoretical research means here and the same term sometimes used to indicate historical, critical or literal studies that attempt to discuss the meanings of design from external views (Sato, 2000).

In order to build a sound theoretical system, two threads of research are necessary. One is to describe the nature of design based on observation and case studies of design activities in real practice and in experimental situations, which are equivalent to experiment and field observation in both natural and social sciences. The other is an axiomatic approach that first develops an epistemological description of basic concepts and their relations in design, and then constructs a formal theoretical system by deductive processes starting from axioms (Yoshikawa, 1987, Suh, 1990). Within general design research, therefore, inductive and deductive approaches, and theoretical, methodological and empirical researches are embedded along with other dimensions. General theories of design provide a common foundation for different design methodologies as empirically developed, to explain their mechanisms with common terms and further enable complementary relations among them to build rich and coherent resources of design methods and tools for practice.

Design methodology, developed based on general theory, is considered "general design methodology" that is still not directly applicable to real practice. It needs to further develop into domain-specific methodology by adding domain-specific knowledge to effectively support design practice in specific areas.

Domain-specific design research

Design of a particular artifact requires a body of knowledge specific to its nature such as intended use, user characteristics, operation methods, material, mechanical structure, electric circuits, software and manufacturing methods. As mechanical engineering directs its concern to the mechanical aspect of artifacts, and electrical engineering concerns the electrical aspect, design, as we particularly use the term human-centered design, concerns the human aspect. Engineering, a well-established disciplinary system responsible for creating artifacts, builds its practice of designing artifacts on the basis of the system of knowledge and methods originated in natural science. The role of design is to offer the structure and quality of interactions

between people and technological systems. This indicates that the intellectual foundation of the design discipline is in the interdisciplinary areas of human science, social science and technology. Therefore domain specific design research develops its framework particularly with human-centered viewpoints in this interdisciplinary area. Research within any specific domain interest such as interaction design, universal design, design management and sustainable design belongs to this category (Sato, 2000). Most of the design research cases presented belong to this category since they all address "design," except for some general aspects of work by Peng, Broadbent and Lim.

Experimental/empirical research

As a basis for understanding design practice or the subject domain of design research, an experimental approach takes the critical role of scientific inquiry in design research. Diverse research methods have been developed in different subdivisions within this approach. Design research inherits some of these well-established methods from other disciplines.

The empirical/experimental model of design research seeks to create knowledge that not only serves the design profession but serves others as well. This model creates free, i.e., unbound knowledge, that, for example, adds to our understanding of human processing of information from a design perspective. This can be considered basic research. The model trades heavily on various forms of scientific research. The goal is to answer a very specific question through developing substantial evidence (Poggenpohl & Sato, 2003).

One dimension in this class of research relates to conditions of data inquiry whether controlled or not. Controlled experiments are basic to scientific inquiry as traditionally used in areas such as natural science, engineering and psychology. There are different roles for experiments; one is to identify relationships between variables of concern, another is to validate theoretical hypotheses, proposed methods and designed objects. Some of the research cases include this class of research as a part of their methods or

as a source of relevant data. Design research that concerns user physical, perceptual and cognitive performance in relation to design parameters, such as typographic features, colors and form, often employ this method. There is some criticism to this approach as analytical and reductionistic that obscures the overall quality of design because it must isolate a very few variables, filtering out the rest as argued by Broadbent. Yet, there is strong need for this kind of research to produce very specific data and guidelines for various aspects of design such as human factors, safety engineering and usability. Many design areas also can benefit from having such research to generate principles and guidelines for design and evaluation, for example in typography or color application as indicated in presentations by van der Waarde, Chan and Pouliot.

The other end of data inquiry is uncontrolled conditions. Observation and instrumentation are origins of scientific inquiry and critical to some areas such as earth science and biology. Some research in social science also attempts to achieve uncontrolled conditions without having interference to the subject of investigation. Statistical analysis is a common method to interpret the acquired data and validate the initial hypothesis as used in controlled experiments. Ethnographic methods have become common in user studies in the early phase of design and also in design research. Jevnaker mentioned the effectiveness of the grounded theory approach in some areas of design research where we do not have established theoretical frames.

Design research often uses combinations of different types of data acquisition, analyses and inquiry methods to supplement the limitations of each method.

The research case by Strickler presented an example for applying empirical methods to assess the effect of real design output. This type of research has not been widely conducted because it often requires a relatively long-term commitment and involvement of multiple stakeholders through the project cycle from pre-design studies to post-design studies. It also provides opportunities to examine not only the direct effects of design but also relations between different stakeholders in design development such as designers, clients and users. For example, methodology development for participatory design needs extensive investigation in the social and behavioral mechanisms of design as a social interaction process.

There are many methods between the poles of controlled and uncontrolled experimental research. Design research often uses combinations of different types of data acquisition, analyses and inquiry methods to supplement the limitations of each method.

Theoretical Model

Theory in general is a coherent system of propositions to explain about a subject of concern in formal and abstract terms. It has to be logically developed from proven facts or other theories by deductive mechanisms. In some areas of research, theories are more loosely defined. Where a formal representation system exists, deductive processes are used to construct theories. In design, as in other physical or social sciences, theories are to explain phenomena in real world. In order to set hypothetical propositions, we make observations or experiments to support the inductive process of forming hypothetical propositions. Inductive processes are often used for identifying a pattern that leads to a hypothetical theory, or for validating how well theoretical propositions represent the subject. General Design Theory is a good example of output from theoretical models of design research. It is the first axiomatic approach to design research. As previously discussed, there is a category of theoretical research that addresses the domain-specific interest.

Methodological model

The goal of this class of research is to produce useful methods for practice or generalized methods. The scale of methods ranges from a method that supports a very specific activity in the design process to a method that supports the entire design process. Results of research are usually implemented as a tool to demonstrate its applicability and effectiveness for the intended roles in design. Some methods are focused on "design" practice and others are aimed at design-related activities common across different disciplines such as engineering and management. Concerning the pattern of knowledge flow, this type of research is similar to the development of new fabrication technology based on scientific principles that enable new ways to design products. It requires some theoretical or scientific foundation to construct effective and replicable methods coherent to the assumed design process model.

The problem most frequently pointed out for this research model is the validation of proposed methods. The effectiveness cannot be easily measured since it requires real use of the method in practice and the evaluation involves many variables. This problem is common to all methodological research across disciplines including engineering design. There are several mechanisms that can be used as pragmatic alternatives to standard scientific validation procedures such as the cycle of hypothesis formation and logical or experimental proof. One is to set clear achievement goals and criteria prior to the development and evaluate the result against them. If the proposed method or concept is verified for enabling the specified function previously unavailable in the design process, the research result is validated. In order to enhance this validation, it is critical to develop a structured argument with a rationale or commonly accepted chain of logic to explain how the original questions and final proposal are connected.

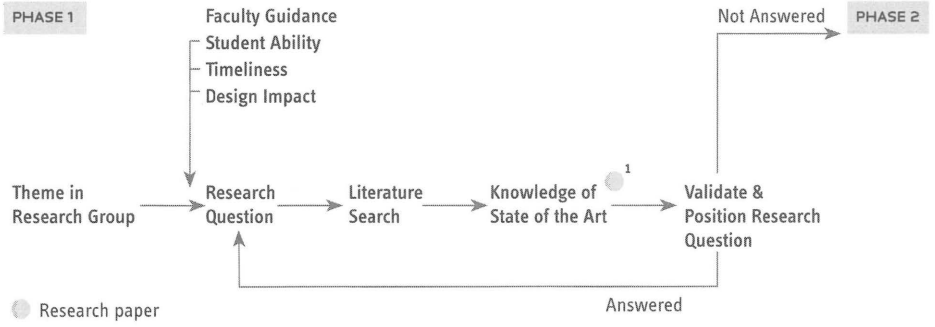
Case-based model

This model uses past real cases as a source of research data or creates a case for simultaneous data inquiry with or without research intention embedded in it. This provides a basis for inductive generation of hypotheses or validation of proposed hyposeses while the case project achieves its own objectives. Case studies in business and design fall into this category. In a specific area, sometimes procedure and data format are standardized for comparison of similar cases and for archiving data for the future.

Procedural structure of Ph.D. dissertation research

Procedural models for different types of design research have been described for Ph.D. students to efficiently organize their research activities. These models exemplify primary activities and their relationship to design research.

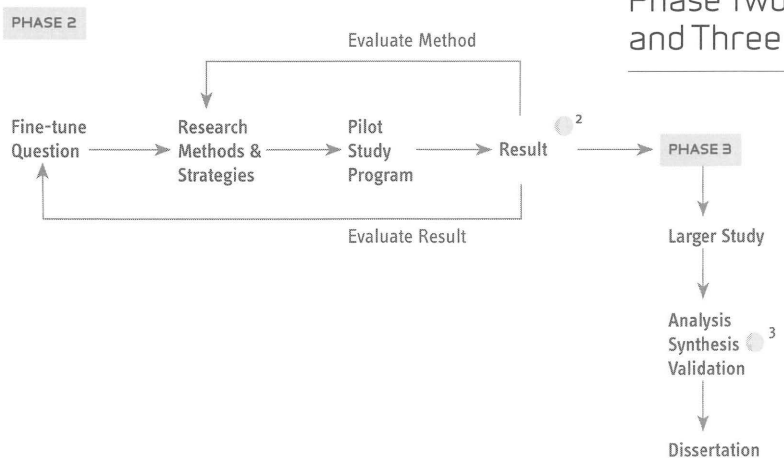
FIGURE 1:
Shared Model of Phase One



The Ph.D. candidate joins a research group that is exploring a particular area of interest. Within the understanding of work and research in this interest area, the candidate seeks to pose a research question. The faculty considers the following: the student's abilities and general preparedness to answer the question, whether the question is timely (able to be answered in a reasonable time) and whether it will have impact on the field of design and beyond. If the question is legitimate and answerable, the student engages in secondary research to determine if the question has been answered. If it has been answered, another question is created; if it is not answered, the question is fine-tuned based on methods and need for evidence (*see figure 1*). Virtually all dissertation research begins with this process, subsequent research development is based on a specific research model. Two models are presented the experimental variation of the empirical model and the methodological model.

FIGURE 2:

Empirical/ Experimental Research Model Phase Two and Three



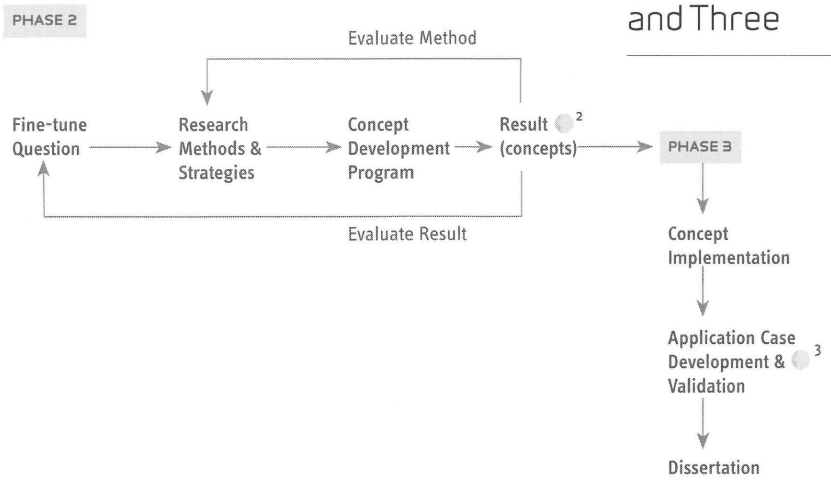
Following a successful conclusion to phase 1, the research question is fine-tuned based on methodological possibilities and their ability to develop evidence through data collection and analysis. When the question and method are in place, a pilot study is launched to test drive the investigation. Problems regarding the design of the investigation, experimental materials, confusion on the part of subject/participants, analytical pitfalls and the reasonableness of the results can result in modification or redesign of the investigation. An appropriate outside adviser often consults on issues of method at this time. If the investigation can be resolved and results seem promising, a larger study (phase 3) is undertaken to more fully develop findings. The findings are analyzed usually from several perspectives, the results are synthesized and the dissertation is written (*see figure 2*).

Three possible papers result from this work at various points in its development. The first paper discusses existing research, its significance, controversies and problems with regard to the research question under consideration. (It is often difficult to find a publisher for research summaries, however such papers provide a general platform for future development.) The second paper can result from the pilot study by focusing on the method issues and the promise of results. In this paper, the candidate is publicly establishing their research territory. The third paper is a product of the larger study and its analysis and synthesis of results. This is the paper we most often associate with writing research.

The methodological model shares the same first phase as the one for the experimental model (*see figure 1*). After research questions are formulated, knowledge of the state of the art is developed through various forms of survey on practice and literature search revealing interconnections between different methods, theories and applications from the perspective of these questions. Through this information development, the Ph.D. candidate needs to identify issues and problems in design practice, develop a map of historical development and different approaches of existing research efforts, relevant theories and methods in

any related areas regardless of disciplinary boundaries. The second phase generates a conceptual/ methodological proposal as an alternative solution to the questions established earlier as shown in Figure 3. The key research activity in this phase is to introduce a well-structured program of the research and construct concepts of methods as a proposal. This involves identification of specific design functions and effective methods of improving or enabling their performance. The third phase most clearly characterizes this research model. The proposed methods or concepts are implemented as a working tool to support design practice. More publications are produced during this phase because the system implementation can be well and easily described in the form of technical reports.

FIGURE 3:
Methodological Research Model Phase Two and Three



Issues of design research

There are some issues that need critical examination for the future development of design research. The issues that were raised in the discussion and presentations directly or indirectly are summarized in this section.

Applicability and accessibility of research output

In spite of its relatively short history and limited resources, design research has produced some significant output. However most of the research output remains inaccessible and underutilized because of the lack of a commonly understood categorization scheme, established dissemination media and archival compilation. This problem also comes from the culture of design itself, that puts little value on referencing other work or information sources, unlike other disciplines built upon an accumulated body of knowledge. Some difficulties pointed out in the discussion can be attributed to the difficulty of applying basic research findings such as theories, methods and guidelines to practical design projects. Is design research producing unusable output? Yes, and No. In any discipline, many layers of research are necessary to build mutually supporting platforms of research output that make their applications ready for practical use. Since the design discipline is expected to provide for the quality of overall human experience with designed artifacts, analytical viewpoints representing individual aspects of the design tend to become less prioritized. It is critical to develop a lifecycle of design knowledge throughout different sectors of the design community. In order to respond to these issues, it is important to investigate and establish effective research indexing models.

Reductionism and Holism

As I discussed earlier, critical views refer to existing approaches of scientific research as reductionism that decomposes a whole into a level that becomes irrelevant to understanding the subject of concern. Alternative methodologies have not been well established even in other disciplines. Design has not established even enough volume of research production in eductionistic realm to

be legitimately concerned with this criticism. In Biology, there are subdivisions from cell biology to ecological study to animal behavior covering a wide range of scope and perspective. As brought up in the discussion of Chan presentation, the ultimate goal of design research is to provide understanding regarding how micro-level variables are connected to macro-level variables.

Communicating with other disciplines

Positioning design practice and research within the real life of other disciplines enhances critical examination of roles for design and design research. As Broadbent explained, the complexity of the domain of concern for design has been exponentially increasing. This complexity brings not only the increase of scale range (vertical complexity) but also the intensity of interactions between factors across boundaries of disciplines (horizontal complexity). It means subjects of design are linked and integrated with subjects of other disciplines. In order for design research practice to effectively produce useful outputs and contribute to both design itself and the rest of the world, communication, collaboration and mutual contributions are critical.

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AUTHOR NOTES

CHRIS CONLEY

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Where Are the Design Methodologists?

Chris Conley is an Assistant Professor and head of the human-centered product design track at the Institute of Design, IIT. His research interest centers on the core competencies of design and their application outside the traditional contexts in which design has been used. This core is supported by research into the theory and methods of criteria development, conceptualization, prototyping and evaluation. His current research involves understanding fundamental principles of prototypes and how they mediate understanding and decision-making. With significant professional experience in product design and user experience research, he teaches product design, planning and user-centered methods to design, engineering and business students.

JAY MELICAN

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User Studies: Finding a Place in Design Practice and Education

Jay Melican is a Senior Research Associate in the Department of Social Sciences at the Illinois Institute of Technology. His work is concerned with the social implications of new technologies and with the ways that product design teams apply social and behavioral research data in their creative problem-solving processes. His professional experience includes software interface design, consumer experience consulting and the development and facilitation of participatory innovation workshops. Jay earned his Ph.D. in Design from IIT in 2000. He currently lectures and advises on research planning and on qualitative research methods at the Institute of Design, IIT and at Interaction Design Institute Ivrea.

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Practicing Collaboration in Design

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A Case Study in Collaboration: Looking Back at the National Graphic Design Archive

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KEIICHI SATO

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Perspectives of Design Research: Collective Views for Forming the Foundation of Design Research

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