Trickle-Down and Bubble-Up: Relationships Between HCI Theory and Practice

ABSTRACT
There has been an ongoing conversation about the role and relationship of theory and practice in the HCI community. This paper explores this relationship through a tentative model, which describes a “trickle-down” of theory into practice, and a “bubble-up” of ideas from practice to inform research and theory development. Interviews were conducted with interaction designers, which included their knowledge of two design methods—affinity diagramming and the concept of affordance—as well as a description of their use of design methods in practice. Based on these interviews, potential relationships between theory and practice were explored through this model. Knowledge of the history or key steps of executing a design method was not found to negatively affect the ability of a designer to apply the key concepts of a method in practice. Opportunities for future research, based on the use of the tentative model as a generative model, are considered.

Author Keywords
Interaction design; design practice; design methods.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms
Design.

INTRODUCTION
In the field of HCI there is, since many years, an ongoing discussion about the relationship between academic and professional practice. The lack of recognition and adoption of research results among practitioners has been seen as a problem for academic research [10]. At the same time, practitioners have expressed that research is not addressing their everyday problems and therefore not offering suitable tools for their needs [19, 23].

In this paper we will explore two aspects of the relationship between academic research and practice. We have labeled the two as the trickle-down effect and the bubble-up effect. The trickle-down effect denotes and describes the way adaptation of research and theory takes place in design practice, including the opportunistic use of methods, tools, or concepts that originated in an academic community to solve problems in a situated design context. The bubble-up effect is an opposing phenomenon, which describes the desire of the academic community to refine and abstract situated knowledge and practice of methods, tools, or concepts into refined theory and defined tools and methods.

Even though the trickle-down and bubble-up phenomena indicate an exchange of expertise and knowledge between research and practice, it is at the same time not a well-functioning relationship where both sides strongly benefit from the other side. This mismatch in the relationship between research and practice is problematic for several reasons. For instance, it means that researchers in many cases spend time and energy devoted to research aimed at supporting practice that is largely ignored by practitioners. At the same time, practice is often shaped by institutional and traditional norms and values that could be improved if influenced by research contributions. This mismatch can be understood as a general devaluing of the “other side,” that is, researchers view practice as uninformed while practitioners view research as not being in touch with reality.

In a recent paper [23], it was argued that there is a need in HCI research to focus more on existing practice. In that study, the relationship of the designer to their tools in the act of designing was found to be significantly more complex than previously assumed. This intentional focus on practice revealed that conceptions of practice in academia (which are then codified in theory and pedagogy) are frequently not grounded in any study of how designers practice “in the wild.” This is not a new phenomenon. Rogers [19] reports on several earlier studies that overall show the same pattern where research results are not adopted by practice in the way intended.

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CHI’13, April 27 – May 2, 2013, Paris, France.
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There is even less research to be found when it comes to how practice might influence research, that is, what we label the bubble-up effect.

This paper reports on our attempts to develop a better understanding of the relationship between research and practice, in particular from the perspective of practice and from practitioners. To explore some aspects of these phenomena we developed an interview study that documented general beliefs about and use of methods by design practitioners, and their knowledge and use of two specific methods—affordances and affinity diagramming—in their design practice.

In the paper we first discuss the relationship between academic research and practice. Then we discuss the history and context of two specific design methods. Finally, we provide findings and discussion from interview participants in relation to these specific design methods, with implications for the relationship between academic research and practice.

THE DYNAMIC RELATIONSHIP BETWEEN THEORY AND PRACTICE

The connection between theory and practice is by many seen as a vital, but often tenuous due to the intersection of competing communities of practice [6, 11] There are different ways to understand the relationship between research and practice depending on focus and purpose. We have, in this project, worked with a tentative understanding of this relationship in the form of information flows from one community of practice to another—along dimensions of impoverishment [19] and in situ detail.

Rogers [19] traced the dimension of impoverishment as it relates to the relationship between theory and practice, but only in the downstream, that is, impoverishing of theory as it is used and adapted in design practice.

The relationship between research and practice can refer to many different potential areas of concern, such as practicalities (time, resources), competence, skills, organization, etc. [6]. In our research we focused on the way design methods are understood, developed, and used in the two communities of practice. In this study, we define design methods broadly, as any intellectual or practical support that a practitioner might use to support the design process in a positive way, encompassing everything from everyday methods, techniques, and tools for idea generation and collaboration, such as the "pen and paper," whiteboard, brainstorming, dialoguing, to methods and applications for sketching and refining ideas. For convenience, we label the flow of information about design methods from research to practice as trickle-down and the flow of information from practice to research as bubble-up.

Based on our tentative model of the relationship between research and practice (see Figure 1) and a preliminary understanding of the two notions of trickle-down and bubble-up we developed our research approach.

In this paper, we first introduce our approach and the two design methods we decided to focus on. We then present our interview study and our findings. At the end, we return to our tentative model and our two concepts and how they can be further developed based on our study.

OUR APPROACH

As a way to examine how practitioners view design methods, as defined in this paper, we decided to focus on two fairly well known design “methods”: affinity diagramming and affordances. We are well aware of the fact that these two “methods” are not necessarily methods in any strict sense, although affinity diagrams have been developed into more formal variations over time [2, 12].

Our choice of these two were based on their difference in apparent source, with affordances coming from ecological research methodology and affinity diagrams most often seen as coming from a business and marketing context (although the true source is cultural anthropology [1]). These methods also represent a range of method types:
from generative and interpretative (affinity diagramming) to descriptive and analytical (affordances).

We researched the history and background of each method, including: attention to the originating field or discipline, contributing authors or scholars, the first entrance of this method into HCI, and the current state of the method in HCI literature.

We have no ambition to be comprehensive or to give a complete description of each method, since that is not the purpose of our work and we also expect most readers to be familiar with them. Instead, we provide some background information as a point of comparison from which interview data can be contrasted and compared.

**AFFINITY DIAGRAMMING**

Affinity diagramming is commonly used as a tool in business to organize and cluster ideas or concepts. It appears to have been introduced to the Western world during the movement to Total Quality Control (TQC) in Japan, and was published as one of seven key business tools [24]. Although this tool became popular in a business context, it was originally known (and is still known in some Asian contexts) as the *KJ Method,* which originates as a method for sorting ethnographic data.

The KJ Method was created by Japanese cultural anthropologist Jiro Kawakita, and was originally created as a way to analyze data obtained through ethnographic methods in the 1960s [14]. Early examples of this method appear to be solitary without significant iteration, used as a way to “let the facts speak for themselves,” grouping facts based on relationships that were perceived to join them [1]. After individual relationships were established, groupings were narrowed down to a reasonable number, generally ten or less. While the method is still used this way in some contexts, it is also used as a generative method, instigating the generation of data from stakeholders, and then evaluating relationships and connections between concepts, instead of only a way to evaluate a known data set.

Beyer & Holtzblatt (2) are some of the first to discuss this method within the HCI community, introducing major concepts and procedures for carrying out this method from the original TQC books [24; see also 16, 25]. Very little research has been carried out specifically on the use or adaptation of this method within the HCI context, aside from the creation of digital tools to support the core activities of the method [7]. However, various forms of post-it note based diagrams seem to be common in both educational and professional settings. To what extent this use is true to the method of affinity diagrams is less known.

**AFFORDANCES**

Rogers [19] provides an excellent historical overview of the notion of affordance, from its early roots in ecological methodologies within the psychology community [8, 9, 21] to the importation of the key idea of affordances into the HCI community through the work of Don Norman [18]. The notion of affordances is defined by Norman as “…the perceived or actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used. […] Affordances provide strong clues to the operation of things. […] When affordances are taken advantage of, the user knows what to do just by looking: no picture, label, or instruction is required.” [18]

However, there are today many different definitions and the way the concept is used differs widely [13]. The underlying concept of affordances is used both with and without its historical roots.

In recent HCI scholarship, the notion of affordances has been reexamined. According to Kaptelinin & Nardi [13], the early work of Gibson informs the concept of affordances, describing the notion of interaction between animals and the environment as primarily a source for insights. They discuss the potential for mediated action as a way to recast affordances as a method for investigating “distinctly human uses of interactive technologies.” [13] This reexamination of the concept attracted substantial interest at the session where it was presented at CHI 2012.

According to Rogers [19] the notion of affordances is an example of a theoretical construct that has transitioned from research to practice while, in the process, losing its complexity and richness. Rogers notes that many practitioners recognize the concept and even “use” it without knowing its background or history.

**INTERVIEW STUDY**

The purpose of our interview study was to find out how the two design methods—affinity diagrams and affordances—are currently understood and used by practitioners. We were particularly interested to discover how much practitioners know about the background and history of these methods, and where and how they learned about it, and to what extent they use it—that is, the trickle-down effect. Implementation of a method in practice, regardless of knowledge of the history or background of a method would be sufficient to trigger the trickle-down effect, rendering these aspects of the method sufficient, but not necessary. At the same time we wanted to find out if the practitioners were aware of any professional practices that have been manifested in more formalized or structured ways or informed attempts to construct design methods based on practice—that is, the bubble-up effect.

**Data Collection**

A phone or face-to-face interview was scheduled with each participant. Each interview followed a semi-structured format, and was audio recorded to allow for transcription and further analysis. In addition, a dedicated researcher took detailed notes either during or shortly after the completion of the interview. We interviewed 13 practitioners from 12 companies. All of the practitioners worked with interaction design, user experience design, or user research in some way. They had a range of
professional experience: several practitioners had 10 or more years of experience, while the majority had worked 3-10 years as a practitioner.

The practitioners also had different educational backgrounds. Of the 13 interviewees, 8 had an HCI-oriented education, 3 had a technical or engineering background, and one had a visual design background. Five of the interviewees were female, while the remaining eight were male.

A subset of the interview participants (see Table 1) is used to facilitate a more detailed discussion of our findings.

<table>
<thead>
<tr>
<th>Name (Pseudonym)</th>
<th>Years of Experience</th>
<th>Vocational Background</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>Abbie</td>
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<td>Computer Science</td>
</tr>
<tr>
<td>Vicki</td>
<td>4</td>
<td>HCI</td>
</tr>
<tr>
<td>Phil</td>
<td>2</td>
<td>HCI</td>
</tr>
<tr>
<td>Jagdish</td>
<td>3</td>
<td>HCI</td>
</tr>
</tbody>
</table>

Table 1: Subset of interview participants

Findings
Our interviews covered a broad set of questions aimed at understanding professional practice in the field. In this particular analysis we have focused on a small portion of the overall interview. These questions do not probe all aspects of the relationship between theory and practice, but they do provide us with some insights into the way practitioners think and reflect when it comes to design methods.

Where did they learn methods?
Some participants learned methods in graduate school, but in most cases dissemination of methods was through encounters with colleagues in a design context. Phil specifically noted his formal education in HCI as informing his knowledge and use of methods, while other designers who had practiced in the field without graduate work explicitly in HCI relied more on their colleagues, professional conferences, or trade publications for their understanding of design methods.

Due to the relative newness of the field of interaction design and the presence of many in the field who are trained primarily in other fields, a strong cross-pollination between related disciplines such as marketing, visual design, and business lead to the adaption and adoption of new methods. Cheryl experienced this phenomenon, tracing an important method for doing “guerilla research” that had been informed by her boss, who had learned this method of research from a marketing company. Cheryl has since written about related methods, further disseminating these ideas into her company and practice community.

Participants sometimes felt that they had made a method up or felt that it was common sense approach, and then found a name to apply to that idea or concept later on. Abbie discussed the “common-sense” nature of affinity diagramming as a basic way of filtering data. She had used this general method prior to learning about it in a more formal sense at an early CHI conference.

What is their conception of research and theory in their practice of design?
While most of the practitioners we interviewed seemed aware of the research and academic community, they did not attempt to forge a connection between their community of practice and the academic community. Cheryl discussed her impression that CHI was generally populated by graduate students, and that she believed in “spreading the wealth” by sending her employees to a broad range of more practitioner-focused conferences, looking to her employees to discover which events were most valuable. This shift to practitioner-focused events was a general trend from our interviewees, with a more direct emphasis on justifying the expenditure to attend these conferences through real and tangible gains in applicable methods.

Abbie reflected on the role of professional conferences, especially CHI, noting that there was too much “big language” and not enough “beer and steak” interaction with peers. This shift to the theoretical and away from the practical was a main reason she has shifted to other venues over time, as she describes herself as an “applied person.” Most interviewees seemed aware of theory, and how it might inform patterns of research or testing, but as practitioners, they mentioned the constraints of client budgets, and how the budgeting process often came in direct conflict with the “proper” application of theory or research-driven approaches to design or user research.

Cheryl discussed the frequent conflict between the need for research, and the lack of willingness from clients to pay for this research. As a result, her company has drifted from more traditional research methods to high-value, low-cost methods of user research, like guerilla research.

How do they utilize methods in their design process?
According to almost all of our participants, designers want methods that are easy to explain to their clients and easy to visualize, for the purpose of assisting them in communicating their design ideas. Ease of explanation and ease of visualization often seem to go hand-in-hand, suggesting that methods can be a powerful tool not only during the design process, but also to facilitate communication about design.

Jagdish noted the use participatory design methods to quickly engage clients and designers around core issues, including them in key design decisions within the interface.
In conjunction with engagement or communication, level of detail was a concern that Phil surfaced, as he related that the “state of finality” influenced the designers and clients he worked with, and thus preferred mediums and tools that didn’t focus on details (e.g. Adobe Photoshop, Adobe Illustrator).

Designers seem to be highly opportunistic in their selection and use of methods, often selecting methods based on context, time and tools available, and designer knowledge. Phil used methods in a highly opportunistic way, selecting methods primarily based on the proximity of the individual: using a document or PowerPoint for people who were unavailable, while preferring to use wireframes with markers for someone in the same office. In contrast, Abbie and Jagdish seemed to focus more tightly on one set of methods—mental models for Abbie and usability testing and iteration for Jagdish—that they applied opportunistically, varying by fidelity and approach given the specific design context.

Designers also adapt methods as needed for a given design situation, often seemingly unconsciously, to meet the constraints or requirements of the specific design problem being addressed. Vicki discussed her use of “scrappy” design methods, noting that many “textbook” methods required more time than she had to do “the right way.” So adapting methods was often the only way to carry out a given method in practice. She further described the importance of implicitly understanding your audience, and using appropriate terms and methods to communicate with that audience. In particular, she described the differences between sharing information with other designers versus working with people from marketing or their human factors lab, highlighting the importance of speaking a consistent language with the people you are communicating with, “translating” terminology where appropriate between disciplines.

**What do they know about the original intent or historical context of the method?**

Frequently, designers seem to lack a clear historical knowledge or context of creation concerning a specific method. In several cases, designers were satisfied in their ignorance, content to label the method as “common sense” or not applicable to their specific area of practice. Specifically, Abbie noted that she had employed the concepts behind affinity diagramming—sorting and clustering—in her design practice for years, and thought of this method as “common sense.”

For other participants, conceptual knowledge of the ideas behind a method is most important, not knowledge of specific “traditional” methods or processes. The company Cheryl works for adapted affinity diagramming based on experiences of some of their designers, using more defined division of labor between designers (including moderation) and “throw[ing] the post-it note over their shoulder” after each idea is complete. This type of adaptation, either corporately or in a specific design situation, was quite common across all of our participants.

Designers also seem to be more focused on *when* to use design methods rather than basing their use on the origin or historically informed use of a method. Phil related an instance of a semantic differential, which was originally labeled as an affinity diagram, then retracted. But later in the conversation, Phil demonstrated a robust hybrid method that he and a colleague had developed, which included many ideas from affinity diagramming. It is clear that knowledge of the origin of a given method, or even prescribed steps to accomplish that method, is not a barrier to using the conceptual idea behind a method in a specific design context.

<table>
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<th>No</th>
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<td>Concept</td>
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<tr>
<td>Historical Context</td>
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**Table 2: Participant knowledge of methods**

In Table 2, the participants’ knowledge of two selected methods is detailed. N/A refers to participants who were not explicitly asked, or did not explicitly answer, the question. While most participants were comfortable interacting with the general concept behind each method, confirmed by a discussion of core ideas from the methods in their design practice, their knowledge of the historical background or context of the method was more limited. Even in the case of affordances, where the participants knew some historical context surrounding affordances, their knowledge was limited to Don Norman’s work that introduced the concept to the field of HCI [18], with no knowledge of the method’s genesis in the work of Gibson and ecological approaches within the field of psychology [8, 9].

**DISCUSSION**

In our discussion we will focus on some aspect of the relation between research and practice that emerged from our interviews, primarily the notions of *impoverishment* and *disseminating agents*. We will then return to our tentative model and reflect on how our findings can be interpreted in the light of the model and the concepts of *trickle-down* and *bubble-up*. We will also add the notion of *cycle-around* and discuss the concept of *design judgment*.

Through our analysis of interviewees responses in relation to our tentative model presented above, impoverishment was identified in both directions:
• an *impoverishment of research and theory*, especially in the application and context-of-use for specific methods by practitioners; and
• a perceived lack of communication between researchers and practitioners, leading to an *impoverishment of practice* as it really exists, leading to theory that inaccurately or incompletely depicts true practice.

It seems to be the case that the impoverishment is especially notable in the linkage from practice to research and theory, since this is a relatively new concept. While design research has sought to understand design practice in a situated sense in the past decade or more, additional valuing of this area of research in the generation of new theory is especially important.

Impoverishment is also found in the intentional or unintentional reshaping of existing methods by individual practitioners, but this is found to be an essential part of using methods, not necessarily a misuse of the original method. It impoverishes the original meaning or defined use of the method, especially in cases where the method or tool is highly formalized, but often results in a richer method *in situ*.

**Disseminating Agents**

Based on the interviews we conducted, a number of disseminating agents were identified that commonly bring design methods into practice (see Figure 2). While research and theory is often assumed to be connected, at least peripherally, to practice, none of the practitioners we interviewed relied on any traditional academic sources for information regarding new methods or perspectives on tool use.

Disseminating agents seemed instead to be linked to industry norms of employment, especially regarding which pools of people work in a given segment of the industry. For example, in more traditional graphic design or marketing fields (even if they are UX centered), prevailing norms of those industries tend to dominate. In newer, UX-focused teams, another balance of people and sources of information dominates.

Regardless of industry segment, primary disseminating agents were people (e.g., coworkers and colleagues from professional groups and associations) and Internet discovery through blogs, news articles, Twitter, and trade publications available online. Of particular interest is the role of coworkers in shaping or redefining a person’s feelings and knowledge about methods. Some of our interviewees learned methods from specific coworkers, or in the context of on-the-job training, while others learned methods more informally through private study, or (rarely) through explicit education in an institution of higher learning.

![Figure 2. The role of disseminating agents in the trickle-down of ideas from research/theory to practice](image-url)

**Trickle-down**

There seems to be a disconnect between how design methods are understood in academia and how methods are applied in practice. There are several potential reasons for this. For instance, the disconnect could be due to the primary discursive modes of communication in academia (e.g., journals, conferences, colloquia), and the lack of substantive overlap with practicing designers, who often communicate with more immediacy through personal networks, design teams, social media, blogs, and trade publications. The disconnect could also relate to the lack of a cohesive design culture within interaction design, or relationship to a larger professional organization, as in architecture (American Institute of Architects), visual design (American Institute of Graphic Arts), and other design fields.

The “trickle-down” effect denotes an often-felt “lost in translation” feeling among academics as they view design practitioners working in the field [10, 11, 19]. While theory and other forms of externalized knowledge is the primary output of the working academic, the working designer produces designs for a client or market. Design methods (including tools, activities, and theories, among others) from academic sources are co-opted by designers in a highly pragmatic sense where the generative work of the designer takes precedence over order or guidance imposed by any one academic method.

These academic methods in use are thereby seen by academics who have an interest or stake in the methods as being impoverished when compared to their original intent and (theoretical) richness and depth, maybe as part of larger intellectual or theoretical approaches. This is especially true in cases where a small concept or term is taken, devoid of context, from a larger theory or base of academic practice, and dismantled in its pragmatic use in an individual designer’s practice. For example, the notion of *affordances* are often seen as singled out from the original context of an ecological approach to research, and applied as a separate and distinct concept, often without the benefit of its historical and academic grounding, in an HCI context (see [19]). It may be possible to see this as if there are stages of “trickle-down” in the sense that a practitioner over time completely incorporates research into their practice without...
being aware of its roots—a continua of trickles that become a stream of common practice.

This “trickle-down” is a natural outcome of the academic tradition being oriented as the center of dissemination (as opposed to the practitioner or designer), and occurs organically as students are educated and theory is applied in practice or disseminated through a variety of forms over time.

**Design Judgment**

The agency of the designer in selecting appropriate methods (or pieces of methods) and combining them in a way that is appropriate to the design process and design problem can be seen as the core of design judgment. While this process is not well understood, it is known that a master designer is highly synthetic, drawing from a variety of sources to undertake and inform their practice [5, 15, 17, 20].

![Diagram](image)

**Figure 3. Observation and abstraction of design judgment in the context of practice bubbles-up to research/theory**

Through analysis of the interview data, the types of methods used by a given designer, and how they came to select those specific methods, was an important window into their personal design judgment (see Figure 3). Specific elements of this decision process in defining a holistic design approach is not well understood, but is vital to understanding the role of ready-at-hand and constructed methods in the act of designing.

**Bubble-Up**

Within design practice, design methods are generally selected and used by designers in an opportunistic, ready-at-hand way. Although historical or academic grounding of these methods may be employed to a limited degree if that contextual knowledge is available, the primary criterion for use is the method’s value in carrying out the design of an ultimate particular [17]—a unique artifact being created at a specific point in time by a specific designer. No one method is seen as capable of completely informing the design of this artifact, and the intuition and judgment of the designer is utilized as the primary form of reasoning and tool selection [4, 5, 20].

The “bubble-up” effect includes the sense from a designer/practitioner point of view that no one tool or method is sufficient to meet the designer’s needs in any one design scenario. In a push toward the synthetic dimension, the designer opportunistically selects multiple methods (or pieces of methods) that may be seen to apply in a given design situation. In doing so, the intention of the original design method is often impoverished, while simultaneously, the ad hoc method (often constructed from many pieces of existing methods) used by the designer constitutes a rich, situated design method created expressly for the design of a particular artifact.

As design practice is sustained over time, the richness of the use of design methods in a synthetic way moves the locus of knowledge generation (in regard to methods) from an academic setting to a situated design context, which has the potential to bubble-up implementation details in an inductive or abductive sense back to the academic community. In our study we did find some evidence that practitioners are engaged in this synthetic oriented activity, that is, they engage with constructing more general or abstract versions of their ad hoc methods. In some cases they had spent some time and energy in codifying or “formalizing” their ad hoc method in an attempt to spread it to colleagues and to the professional community. Based on our findings we do believe that it is possible to find examples of how design practice have informed not only the professional community but the academic community, bubbling-up the richness and detail of practice into a theoretical understanding of methods use.

This “bubble-up” of design detail relies on two crucial factors:

- the interest of the academic community in engaging rich design practice as a form of knowledge generation or inquiry; and
- the recognition that designers use a wide complement of ready-at-hand methods to construct their design practice and experience.

Assuming this loop comprised of the opportunistic use of methods, and the academic interest to understand and study design practice, a cycle of theory-creation and situated use of theory may be developed over time.

**Cycle-around**

Based on our model and our interviews, we are convinced that it is possible for cyclical movement and re-discovery from both sides of the model to happen, but it is quite a challenge to value both sides of discovery equally, and for both sides to respect the everyday reality and discourse of each other (see Figure 4).

The reuse of methods in practice is well established and somewhat well understood, but re-discovery from practice back to theory is an area for significant additional exploration for reflective practitioners and researchers alike. Cycle-around would represent an ideal case of tightly coupled research and practice, with each community of practice informing the work and practice of the other and
perhaps more important, valuing the work and knowledge of the other.

Core ideas and activities possible to inspire new design methods can be found in everyday practice. These ideas and activities may be carriers of some interesting qualities based on the fact that they are “born” in the midst of practice and have survived. Core concepts or modified methods that have emerged in a practice environment could be studied along lines of dissemination, felt effectiveness, and adaptation over time. By comparing and analyzing these concepts and methods it may also be possible to identify characteristics that are needed for methods to survive and be of use in everyday design practice. In addition to locating methods that have survived practice, it may also be instructive to examine practices that have been disengaged from the practice community, eventually being discarded in favor of new methods. There seems to be a continual cycle of birth, use, and disuse of methods, which may provide insights into how this cycle-around has historically functioned through the lens of practice and academia.

A closer examination of everyday design practice may also reveal core activities that are currently unknown or unevaluated from an academic perspective, which could potentially be refined and redesigned (bubble-up) for broader use.

Targeting the research/theory side of the model, a comparison or analysis of design activities carried out in practice could be performed within the lens of existing theory. This comparison and analysis could serve to enrich and extend current theory, while creating a connection and alignment between theory and practice.

A more direct analysis of the bubble-up process as a synthetic activity may also be valuable to surface issues of designer competence and dissemination of concepts over time. This analysis could help researchers to explore why some “core ideas” within design methods seemed to be “common sense,” according to some interviewees. For instance, the core ideas of affinity diagramming—the sorting, grouping, or clustering of elements—being seen as common sense, and disconnected from the source method. While some core ideas may be quickly disconnected and used independently from a formalized method, eventually entering the realm of “natural” or “common sense,” other formal methods never seem to degrade beyond a certain point. Exploration and examination into this degradation process from a formalized method to these varying degrees may yield important insights into how methods are modified, how they enter into an everyday design vocabulary over time, and how they may eventually die.

There is an opportunity to more closely examine the existence, role, and activities of various disseminating agents. In our study we have defined these agents by their function, but it would be interesting to further study how they function, and what the preconditions are for different forms of agents to exist and work. Disseminating agents to be studied may include corporate and individual entities. Individual entities may include prominent designers,

**Figure 4. Attention to observation and abstraction of practice and dissemination of new ideas from research/theory results in a cycle-around**

This cyclical movement and re-discovery challenges the conception that theory and practice are naturally disconnected, and the presumption that things begin in certain places or activities. Instead it assumes that ideas start in a variety of ways with multiple points of entry and inspiration (as well as points of deterioration and upscaling). There are always pieces of reality in use by the opposing community of practice from either direction, not just downstream impoverishment, but lack of engagement forces these pieces of reality to be interpreted in ways that are incorrect or inappropriate.

An opposite phenomenon may also exist, whereby an idea or method coalesces or is distilled over time, as it works through a cycle of research/theory and practice, where over time, only the core idea remains. This phenomenon represents with relative accuracy the current core of affordances in the HCI community. While it has changed and been refined over time, there is general agreement between the research/theory and practitioner communities of practice as to what constitutes an affordance, allowing mutual communication and exploration.

**IMPLICATIONS FOR FUTURE RESEARCH**

We are convinced that our study has helped us to produce a set of possible research questions that have the potential to lead to more concrete results.

It is possible to ask specific questions in relation to our model and the specific concepts we have defined, applying the model in a generative way to isolate and explore opportunities for further research in the contexts of academia and practice, as well as in liminal spaces between these contexts. We will briefly discuss a few directions that we see as potentially interesting research studies that can be built around our results.
scholars, or authors of well-known methods. Corporate entities might encompass trade publications or digital resources, professional conferences, well-known design agencies, and professional organizations.

There are also significant pedagogical implications for this examination of practice, potentially narrowing the gap between the education of practitioners and the realities of practice. The education of practitioners frequently follows a “studio” model of education, whereby the educational community is tightly coupled with the practice community which graduating students are expected to join [3, 20]. By evaluating the ideal system state of “cycle-around,” additional research and observation of practice could create opportunities for tighter alignment of the education and practice communities. Specifically in the area of methods use by design practitioners, study of actual use “in the wild” may significantly change the way that methods are introduced and the way their use is evaluated in the context of an overall pedagogy. Incidentally, there is a more natural alignment of this system with the research community at present, as new students disseminate research in a trickle-down motion as they enter the workforce. Thus, tactics for ensuring ongoing alignment between the education and practice communities should be considered, not unnecessarily privileging the research/theory side of the cycle.

CONCLUSION
We believe that the framing we have offered of the academic-practitioner divide as a dynamic relationship of impoverishment and situated action opens a number of avenues for future research.

One of our most important contributions is that we have shown that the relationship between research and practice is not only a question of practice not using research results, which has so far been the focus of the discourse in the academic community. In contrast, from our interviews, we found that practitioners use a multitude of design methods in an opportunistic manner, and do not discriminate based on the source of an individual method, or even a conception of “proper” use of a method.

Another contribution also defies the common conception that practitioners are not interested in theory or research developed design methods per se. We found an interest and a desire from practitioners for additional methods grounded in research, but practitioners noted that these methods have to be in resonance with their own experience of design practice and their own conceptions of how expert designers use methods [22]. However, we found in our interviews that the practitioners do not find such resonance to be common; instead methods are, in their view, not based on a sufficient understanding of the realities of practice. So, the problem with academically developed methods is not necessarily that they are too theoretical or too abstract but that they do not enough respect and consider the practicalities of everyday design practice.

The divide as we define it highlights the value of studying design practice in more direct and more careful ways, understanding when and how traditional methods and tools are used, and how this tool use is adapted based on the at-hand design problem and the judgment of the designer. Additionally, research and theory should be grounded in and informed by practice, and remain connected to known disseminating agents within design practice to have more immediate and lasting benefits.

If the proposed cycle exists as we postulate, a tighter coupling of research and practice—both in temporal and discursive contexts—is vitally important. Our interview subjects specifically requested initial results, as they were eager to hear differing perspectives on method and tool use from other designers. Connecting research and theory generation more directly to this conversation only exists to increase relevance and usefulness in design practice.

ACKNOWLEDGEMENTS
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REFERENCES


