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DESIGN TALKING: HOW DESIGN PRACTITIONERS TALK ABOUT DESIGN RESEARCH METHODS

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ABSTRACT

To support the development of *TheDesignExchange* – a portal to a comprehensive set of design methods applicable to a range of disciplines – we hosted a series of workshops with design students, educators and practitioners. In this paper, we summarize insights gained from the three practitioner workshops associated with early stage design methods used to: *Research*, *Analyze* and *Communicate*. We contrast the practitioner feedback with insights from previous workshops with design students and educators. We also discuss implications for enhancing professional skills and industry practice through design education.

INTRODUCTION

TheDesignExchange portal is being developed to facilitate the capture, analysis and widespread use of methods associated with early stage design. Although the integration of design into the product development process has been shown to have high impact on the quality and success of engineered products [1], finding the right design method for any particular problem can be a challenge [2, 3]. *TheDesignExchange* fills a need to organize disparate early stage design methods, develop a community of design educators and practitioners to evaluate those methods, and educate the next generation of design innovators. *TheDesignExchange* provides a structure to collect the many design methods in use today, their variations, and examples of use [4-9]. The portal aims to support the design process by providing educators and practitioners alike with a versatile library of proven tools.

Given the community-of-practice model and wide application of design processes/methods, *theDesignExchange* portal is fundamentally multi-disciplinary. The subject matter draws on the diverse range of contributors engaged in "design thinking" [10-13], a human-centric multidisciplinary design process (engineers, designers, architects, business people, educators). By recognizing and promoting the common thread among these different disciplines, *theDesignExchange* supports the cross-pollination of methodologies among them. By allowing a community-based discussion and documentation of design methods, *theDesignExchange* has the potential to be the world's first open innovation archive of design-practice-related subject matter [14]. To accomplish this, we are drawing on previous work in design theory, communities of practice, and expert/lead user-generated content.

This paper focuses on insights gained from a series of workshops aimed at understanding user needs associated with *theDesignExchange*, as well as the development of an ontology for organizing and talking about design methods [15].

BACKGROUND

To gather broader input from the design community to support the development and to help frame the features for *theDesignExchange* portal, we conducted nine workshops with design students, faculty and practitioners. The first four workshops with novice designers, academics, and experts, described below, were used to develop an initial ontology feature base that was refined later during a series of five workshops with design practioners. Participants in these four workshops had backgrounds from a wide range of design-related disciplines in architecture, engineering, computer science, interaction design and industrial design. Others who specialized in design research typically had degrees in human-computer interaction, social sciences or humanities.

In the **Novice Designer Workshop** *(26 April 2011; 25 undergraduate students from the University of California, Berkeley)*, design students from engineering, computer science, rhetoric and architecture were invited to a co-design workshop. Starting with a brainstorm, the group identified areas where the students need support, as they become members of the design community of practice. The students were divided into small groups to brainstorm solutions for each area. The results showed that: (1) students are interested in becoming a part of a professional community by making connections and building a reputation; (2) students are interested in building expertise on design methods and processes; and (3) students are interested in tracking and sharing their work to get guidance from experts.

Two **Academic Workshops** were held in 2012 with a total of 50 attendees at the NSF CMMI Grantees Conference in Boston and ASME's IDETC/CIE Conference in Chicago. The great majority of participants were from mechanical engineering, but some were from other fields of engineering such as civil engineering. At these workshops, we worked with design educators and researchers to explore communication between researchers and practitioners; to identify features and functionality they'd find useful; and to develop a research agenda for *theDesignExchange.* We found that: (1) attendees were interested in how to port human-centered design methods to new disciplines, such as civil engineering; (2) attendees were interested in the gap between theory (classroom) and practice (industry), and the lack of formalism in practice; and (3) attendees were interested in when methods/processes failed, as well as when they succeeded.

The **Expert Designer Workshop** (*27 April 2011 with design experts representing Autodesk, IDEO, Portigal Consulting, and Lunar)* was used to present *theDesignExchange* concept and discuss what would entice professional designers to participate in an online community focused on human-centered design. These experienced designers had degrees from either mechanical engineering or computer science. Results showed: (1) designers are interested in contributing to the community, and especially in mentoring students, but they need to be able to do most of their activities in short sessions (5-15 minutes); (2) designers seek inspiration and ways to "get unstuck"; (3) designers seek a way to build their reputations with clients and peers; and (4) designers need to educate their clients on how they work.

Based on these workshops, a prototype of *theDesignExchange* was developed and deployed with methods organized around five preliminary categorization schemes associated with the design process: *Research*, *Analyze*, *Ideate*, *Build*, and *Communicate*. All methods included in *theDesignExchange* come from external publications or common practice (e.g., [5-8]).

One major insight from these prior workshops was the value that both students and educators placed on authentic learning, which would shape students' professional skills and competency for design practice across a wide range of disciplines and settings. The expert designers emphasized the need for lifelong learning and a desire to learn new methods to get "unstuck" when old methods failed. They were also interested in improving the perception of their reputation and competency with their clients and peers. The desire for "authenticity" and advancement within a community of practice led our team to work more closely with design firms through a series of industry-based design workshops.

METHODOLOGY

Design Practitioner Workshops with designers from the San Francisco Bay Area in California were held between July and November 2014. Invitations to the workshops were distributed to a mailing list of professional designers and design researchers in the local geographic area. Approximately half of this pool identified themselves as human-centered design researchers or user experience (UX) designers. The rest were industrial designers, product designers, design strategists, and design educators. Half had worked in practice for less than four years, whereas 25% had over a decade of design experience. The number of industry professionals attending each workshop ranged from 20 to 35. This paper focuses on insights gained from the three workshops associated with conducting, analyzing and communicating design research: *Research*, *Analyze* and *Communicate*. Each workshop was hosted by a different partner organization, but followed a common format:

- Networking and refreshments
- A short presentation by the workshop facilitators introducing the topic and workshop activity
- Hands-on activity
- Share-out and discussion

TheDesignExchange team worked with a member of the host company to conduct each workshop. Members of *theDesignExchange* team took notes and photographs to document the workshop activities and outputs. Researchers were available to take notes during both the small group discussions and the large group share-outs. All of the created documents, drawings, and clusters were also collected for later analysis. Activities for these workshops were chosen to engage participants in a meaningful design activity that could then be used to inform *theDesignExchange*. A brief description of each activity is provided below.

Workshop on Research Methods

The workshop on *Research* methods focused on those methods that are used during product development to understand the customer, user, context of use, and/or competitive landscape relevant to a particular project – anything that brings external information into the project. An example research method is a *Cultural Probe*:

> **Cultural Probes** are used to gain insight into and inspirational responses about the daily life and habits of communities. To gather inspirational data about people's lives, participants are given probes, small packages that can include any sort of artifact (like a map, postcard, camera, or diary) along with tasks to allow participants to record specific events, feelings, or interactions.

The primary activity for this workshop was a *closed card sort* of design research methods, conducted in two rounds. The workshop, held at IDEO, had 35 participants, and seven members of *theDesignExchange* team in attendance. In the closed card sorting exercise, the participants were asked to group or cluster methods into predefined categories to reveal under which category participants could agree each method belonged. Each method was placed on a *method card*, an approximately 3x5 card that had the method name on the front and the method description on the back. An example method card is in Figure 1a. At the time, *theDesignExchange* contained

122 methods within the design research category, but 2 were deemed redundant and 120 method cards were created.

Eight categorization schemes were developed to help differentiate methods from each other. These schemes drew on insights gained from the four workshops described previously and prior work (e.g., [7-9]). Each categorization scheme included 2-5 categories of method types. For example, consider the categorization scheme for *Researcher Location*. This scheme includes four categories: present, absent, varies through method, and remote. A category card (Figure 1b) was created for each of these four categories. With all categorization schemes, 26 category cards were created, making up the collection of predefined categories that participants were asked to sort methods into.

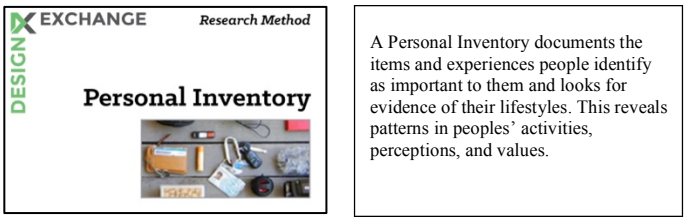

Figure 1a. AN EXAMPLE METHOD CARD WITH THE DESCRIPTION THAT WAS PRINTED ON THE BACK.

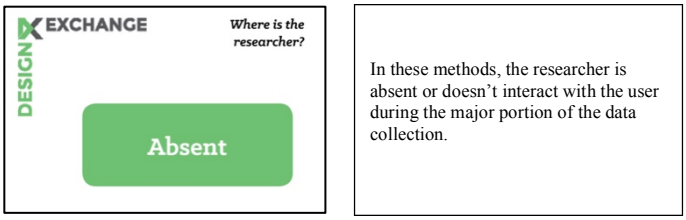

Figure 1b. AN EXAMPLE CATEGORY CARD WITH THE DESCRIPTION THAT WAS PRINTED ON THE BACK. THIS CATEGORY IS FROM THE CATEGORIZATION SCHEME "RESEARCHER LOCATION".

In the first round of the card sort activity, participants were broken up into 16 groups of 2 to 3 people, with *theDesignExchange* team members helping to fill out groups. Each group was given two sets of cards: one set of 60 method cards representing half of the methods in the research method category; and one set of category cards that corresponded to the categories within one categorization scheme. Participants were also given blank category cards to encourage them to reword or add categories if they felt it were helpful to complete the card sort.

Groups were given 20 minutes to sort the method cards by the given categorization scheme, and change the categories within the scheme if they desired. Each categorization scheme was given to two separate groups, who each had complementary sets of methods, so that all methods were categorized in round one for each scheme.

In the second round, teams were asked to find their complementary group to make teams of 4 to 6 (Figure 2). Teams compared and discussed how and why they had adjusted the categories, if at all. Based on this discussion, more adjustments were then made by some teams.

Finally, each team presented their final categories for the categorization scheme they worked with, along with their open questions and concerns. A short discussion was facilitated before moving to the next team.

Figure 2. PARTICIPANTS SORTING RESEARCH METHOD CARDS.

Workshop on Analysis Methods

The *Analyze* workshop focused on methods that are used to take the team's existing knowledge along with what was learned through *Research* methods and remix it all into usable input for ideation and prototyping phases of the product development process. An example analyze method is a *2x2*:

> A **2x2** is an organizational diagram to illustrate trends, outliers, and areas of saturation and scarcity in a design space. Often, a 2x2 is used to find opportunities for innovation or to compare the relative quality of concepts. A 2x2 is created by plotting two evaluation criteria (e.g., feasibility vs. potential impact) on the two axes.

There is little prior work in categorizing design analysis and synthesis methods. Perhaps the deepest look at the process to date was completed by Jon Kolko [6]. As such, there are a number of open questions not just in how to categorize methods, but what different methods are useful for when trying to transform information from raw field notes and data into something usable for design and ideation. Given this, the analyze workshop, held at frog design, was focused on understanding what this process looks like. The activity chosen was for participants to create journey maps of their processes for analyzing and synthesizing information that has been collected. A *journey map* is a visual depiction of a person's experience, highlighting the key interactions and activities. It is often used in design and user research to map a customer's experience with a product or service, and was a familiar exercise for most workshop participants.

In preparation for the activity, analyze methods were organized by the structure of their output (*charts, clusters, flowcharts, hierarchies/trees, insights, matrices, network diagrams, rankings, schematics, timelines, Venn diagrams,* or *unstructured*) and listed on a reference sheet, as shown above in Figure 3.

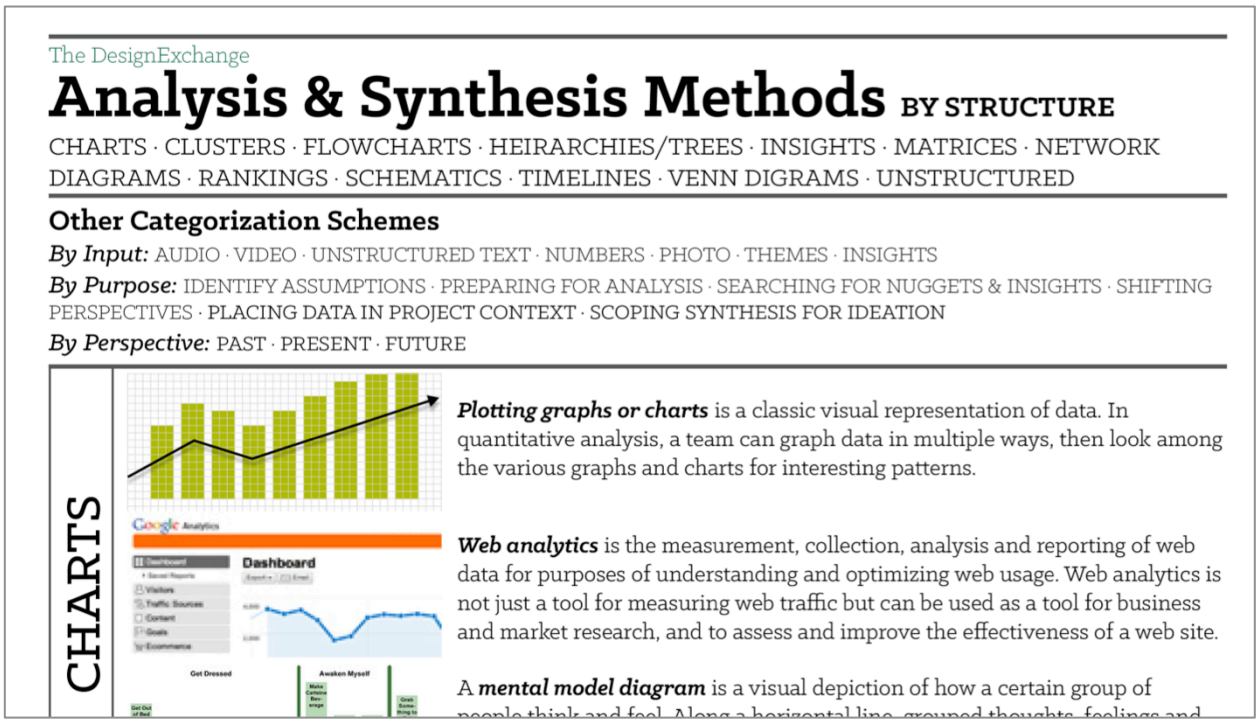

Figure 3. A SAMPLE OF THE ANALYZE METHODS REFERENCE SHEET. THE TERMS "ANALYSIS & SYNTHESIS" ARE MORE COMMONLY USED AMONG PRACTITIONERS, AND WERE USED FOR CLARITY.

At the workshop, participants were given 20 minutes to create a journey map, either alone or with a partner, of an analysis project they had recently participated in, drawing on the methods in the reference sheet. In the next 20 minutes, participants were asked to compare their mapped experience with another (Figure 4). Finally, participants were asked to share out in the large group what they had learned from comparing the maps during a facilitated discussion to wrap up the workshop.

Figure 4. PARTICIPANTS CREATING A JOURNEY MAP OF ANALYZE METHODS.

Workshop on Communication Methods

Communication methods are often thought of as secondary to other methods within design. However, communicating ideas, insights, and other information is often key to the success and adoption of a design project. An example communication method is a *Persona*:

Personas are imaginary characters – based on real people – that represent specific user archetypes. The aim of a persona is to illustrate the user's behavior patterns, but they are also very useful in communicating research summaries to clients and team members.

To better understand how practicing design and user researchers think about communication methods within their practice, a more open-ended activity was chosen for the Communication Methods workshop, held at gotomedia. Participants were each given 5-10 blank method cards, as shown in Figure 5. They were then given 5 minutes to fill out these cards as best they could.

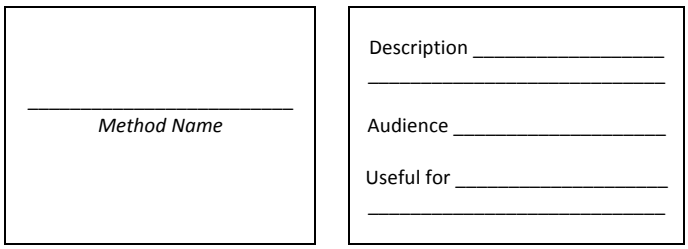

Figure 5. BLANK METHOD CARDS GIVEN TO EACH PARTICIPANT.

After completing the initial card creation, participants were grouped into teams of 3-4 to discuss and sort the cards in an open card sort. In an open card sort, participants organize concepts or topics, in this case communication methods, in any way that makes sense to them, and may reorganize methods multiple times before settling on something that they believe reflects reality (Figure 6).

Figure 6. PARTICIPANTS SHARING THEIR COMMUNICATION METHOD CATEGORIES.

After the conclusion of the open card sorts in small teams, the workshop participants reconvened to share the developed categories, and to discuss communication method characteristics.

DISCUSSION OF FINDINGS

Participants from every workshop asked when *theDesignExchange* site would be available, and requested access to the workshop materials, especially the cards created for the research workshop. This suggests the excitement and engagement lead users may demonstrate as *theDesignExchange* launches and becomes available for use. In addition, each workshop revealed different considerations of practicing design and user researchers when deciding which methods to use for a project.

Research Workshop

In the *Research* workshop, participants highlighted several missing method categorization schemes, some of which were suggested as replacements to the categorization schemes presented in the workshop. These missing schemes help illuminate factors researchers consider when choosing research methods, and represent areas of further research. For example, whether a method is non-intrusive (e.g., direct observation, behavioral archeology, diary studies) or requires interaction with the user/customer/stakeholder (e.g., interviews, card sorting) was deemed important. The schemes are listed below:

- How intrusive is the method?
- Does the method look into past data or attempt to predict the future?
- How long does a method take?
- Can a method be performed with a client?
- Does the client understand this approach?
- What level of skill is required?

One categorization scheme that the participants did not find useful was the formality of a method. The groups working on that scheme had a difficult time parsing whether "formality" referred to being planned vs. spontaneous or novice vs. expert or some other interpretation, and did not think it had a substantial bearing on whether a method was appropriate for a particular project. Several teams also found a group of methods that they began to categorize as *techniques*, which they defined with the questions "Is this a tool I would use to augment the method and research I am already doing, or is it a separate method of it's own?" The teams with the "Purpose" and "Stages" schemes each branched out their terms in ways that blended the two schemes together, showing that the *purpose* of a method may be to help accomplish a *stage* in the design or research process.

Participants also raised several questions regarding how a user of *theDesignExchange* would select methods or method sets. In particular, they wanted to know:

- How would a recommendation system function in order to help a user in the discovery process?
- Would case studies be available to help a user understand how a method is used in context?

One pair of participants were so interested in the question of factors for method selection and recommendation that they chose to spend their time thinking through the questions they would ask to choose a method, rather than participating in the card sort. Additional considerations that arose from this discussion include:

- What are the inputs and outputs necessary for each method?
- What resources are available?
- Who needs to be involved (clients, stakeholders, own team, etc.)?
- Who is the audience for the research?
- What methods would be fun/interesting?
- What kinds of stories would be most impactful?/What will inspire your research team?

The questions regarding how fun, interesting or inspiring a method might be were particularly interesting and yet troubling from the standpoint of categorizing methods. Entertainment and inspirational value are generally subjective qualities, but these questions brought up a good point about method selection: often, several different methods may appear equally appropriate when practitioners are faced with choosing a design research method, and the practitioner may default simply to what seems interesting without any better way to make a decision. On the other hand, how engaging a method may be to the customers and to the users recruited to participate in the research is an important consideration, requiring some foreknowledge of those you are recruiting. This poses an interesting area for future work, as *theDesignExchange* seeks to provide users with an appropriate and engaging design method.

A final discussion point raised in the workshop was in regards to the effect of bias in design research. Based on one participant's experience in cultural anthropology, she underscored the importance of taking care to understand what your biases are and working to minimize their impact while

collecting data. She suggested adapting this into design research by considering how certain methods might be more applicable for reducing bias than others.

Based on the workshop feedback, the final ontology for design research currently in use for the beta version of *theDesignExchange* is presented in Table 1. This version will be refined as *theDesignExchange* users provide further feedback.

Table 1. RESEARCH CATEGORIZATION SCHEMES

User Setting	Natural, artificial, setting independent, pre-setting
User Role	Collaborator, expert, observed, self-reporting, mindset-dependent, not applicable
Approach	Intrusive, non-intrusive
Researcher Location	Present, absent, remote, varies through method
Unit of Collection	Individual attitudes, collective attitudes, behaviors, projected behaviors, attitudes and behaviors, participants
Data Type	Quantitative, qualitative, mixed methods
Purpose	Bound the research, draw on previous work, recruit participants, explorative co-design, evaluate desirability, evaluate business viability, evaluate implementation
Time Perspective	Future, present/past, not applicable

Analyze Workshop

In the analyze workshop, several insights were gained into the desires of participants to improve their process. One participant pointed out the benefit of discussing process with others who have a different point of view, which reflects the need of these researchers to have meaningful interactions with their peers. She stated:

> *In our group, we didn't know each other or what we work on; explaining to someone you've never worked with before allows you to crystallize your process. It's a good reminder to work things out with people who have distance from your project.*

Another participant confirmed the value of this interaction, saying it was "assuring, reaffirming; it's nice to know, 'yeah, this is how you do a research project.'" This revealed that even practicing design and user researchers have doubts about their practice, which helps explain their motivation for participating and sharing their experiences in order to get feedback and hear others' ideas.

Discussion during the workshop also highlighted the need for two new categories: reflection time frame and appropriateness for audience. *Reflection time frame* would separate methods based on whether or not they were appropriate for quickly processing information directly after data collection or for a deep analysis over a longer time period. One participant shared an experience in which she had brought engineers into the field with her to learn about their end users. After each site visit, they would go to a pub or coffee shop and asked each person to highlight the top three surprises from the visit and top three questions they wanted answers to in the next session. This led another participant to bring up the difference between short-term and long-term memory synthesis. He compared the immediate impressions a researcher has after leaving a research session (e.g., an interview) to sushi because it is only fresh and rich for a short time, saying "don't underestimate the value of the pub after a design research session, when the debrief is fluid and drawn from short-term memory". He then pointed out that methods for this short-term memory synthesis are often overlooked. The discussion then turned to the need for the inclusion of more early-stage methods in practice. Several possible examples were brought up, including:

- A "debrief sheet" to immediately reflect on a research experience
- Writing one's immediate reactions on post-it notes, which could then be clustered later
- Blogging, which could be especially useful to immediately update partners at a distance

The second category, *appropriateness for audience,* would separate methods into tiers of "readiness" for clients (whether internal or external to the research organization), ranging from methods only appropriate for the research team to participate in, to methods appropriate to include the client without any special preparation.

These two new categories reflect the larger discussion point of the importance of iteration. Participants discussed the need for iterative methods in order to strengthen the story found in research. The final insight that brought much of this discussion together was that internal analysis, such as identifying patterns in the field, may happen quickly and early, but creating a shared understanding with the rest of the team requires more time and analysis, with an equal increase in time and analysis to present to clients and external stakeholders. One participant made a point that gets to the subject of the next workshop on communication methods:

> *It takes a number of steps to go from the internal understanding after an analysis session to get to what you want to say when you present it. Those iterations make a stronger and stronger story. You end up realizing things through this iterative process that will blow your mind.*

Based on the workshop feedback, the final ontology for analysis methods currently in use for the beta version of *theDesignExchange* is presented in Table 2. This version will

be refined as *theDesignExchange* users provide further feedback.

Table 2. ANALYZE CATEGORIZATION SCHEMES

Purpose	Identify current beliefs, bring in new data, search for nuggets, shift perspectives, judge relevancy, scope for ideation
Reflection Time	Short-term, long-term, either
Approach	Intrusive, non-intrusive
Inputs	Observations/images, text/quotes, themes, concepts, insights, quantitative data
Outputs	Charts, themes, timelines/trends, imperatives, network diagrams, flowcharts, rankings, hierarchies, perspective shifts, Venn diagrams, matrices
Time Perspective	Past trends, present situation, future possibilities
Structure	Unstructured, simple, highly structured
Audience	Internal team only, prep necessary, client appropriate

Workshop on Design Communication

In the communication methods workshop, it became very clear that there are two major communication tasks in the design process: The first is communicating the research findings to stakeholders, whether internal or external to the design team, who did not participate in the research. The *persona* method introduced earlier would be an example of this kind of communication method. The second task is communicating the final design concept. This is often done in the form of a prototype of some kind. The communication methods we were expecting to collect were those dealing with the first of these two tasks, as prototyping was addressed in a separate workshop, but it was difficult for participants to identify prototyping as distinct from design deliverables, and many prototyping methods were offered as communication methods. In both cases, the use of presentations was noted as a "general way to catch everyone up", but is limited by the fact, as one participant pointed out, that "there is no tangible way like tests in school to see if everyone – the clients, the team, everyone – is on the same page." Though this was discussed in a small group, no resolution or solution was developed, and may represent an area for future study and innovation within the design process.

The discussion at the end of the workshop led to the development of two new categories for communication methods: level of tact and level of persuasion. *Level of tact* would help classify methods meant for dealing with sensitive topics or material that may not be what the audience is hoping or expecting to hear, such as bad news about the perception of a company's brand or product. *Level of persuasion* would separate methods based on whether or not they are useful for persuading the audience of a certain view as opposed to simply presenting findings or facts. These two categories developed out of a discussion about the designers' concerns in dealing with "suits". A participant suggested including only the main points with the most powerful quotes and information, and then "put it all together with an entertaining show" to increase your level of persuasion. Another participant pointed out, though, that you "have to be careful not to trample their egos, or else your suggestions will be received poorly", leading to a discussion about the different levels of tact needed with different audiences. Other high level questions were asked that related to method organization and selection:

- How much does the audience know beforehand?
- Does the audience need a background in the process that was employed?
- How does an audience's (often short) attention span affect method choice?
- What is the difference between communicating inside vs. outside the research group?

Further discussion mainly revolved around the importance of empathy building in communicating design research findings. Participants expressed the importance of communicating findings richly enough for the participant to be able to go on and effectively communicate the findings to another person. A participant spoke of the power of putting an audience in the environment (e.g., hosting an experiential presentation) for communicating findings richly and effectively. She offered the example of a seminar for parents and others who care for children with dyslexia where words are rearranged and written backwards so the caregivers can understand what the children are experiencing. Participants also discussed the struggle to make information empathetic while also being easy to understand at a glance, discussing the use of frameworks, charts, and infographics, and suggesting testing the communication materials you develop both inside and outside your immediate team.

Based on the workshop feedback, the final ontology for communication methods currently in use for the beta version of *theDesignExchange* is presented in Table 3. This version will be refined as *theDesignExchange* users provide further feedback.

Table 3. COMMUNICATE CATEGORIZATION SCHEMES

Audience	Core team, core team + immediate collaborators, full team, users, mass
Medium	Conversation, document, experience, presentation
Purpose	Inform, resolve conflict, facilitate discussion, inspire, plan, build empathy

Format	Tangible, virtual, either, mixed
Level of Persuasion	No persuasion, low, medium, high
Level of Tact	Little, some, a lot

CONCLUSIONS AND FUTURE WORK

The workshops validated the need for *theDesignExchange* and many of its features: providing a central repository of early design stage methods, engaging all stakeholders in the design community of practice, and integrating online learning with real case studies to demonstrate the methods. More details on the ontology itself can be found in Roschuni et al. [15]. The proposed ontology has been incorporated into a beta version of *theDesignExchange* [16]. It is currently being tested on design student populations, as well as with the designers and design researchers who attended the original workshops. We are also implementing a machine-learning algorithm for use in a recommendation system of design methods, building off prior work by Fuge, et al. [2]. The evaluation of both the ontology effectiveness and the recommender system will include task exercises, user logs on search terms and precision/recall tests.

The workshops provided some unexpected findings as well. We originally assumed that the primary audience of both the site and the workshops would be novice designers – students and recent graduates. To our surprise, we learned that even experienced designers wanted to hone their skills and learn new methods outside their sphere of practice. Both novice and experienced designers were interested in validating their skills to peers and potential clients and employers, as well as exploring the nuances of skills and methods they were already familiar with. On top of honing their skills, both experts and novices also wanted to "talk about design" within their community. Participants generally found the workshops to be fun and expressed gratitude at being able to talk "with people who get it"

The implication to design education is that evidence of proficiency in design thinking skills is needed both in academe and industry. Future research will explore how to measure proficiency in understanding methods in *theDesignExchange* and proficiency in applying them to challenging design problems. The workshops motivated a new goal of creating spaces and opportunities for novices to learn from experts and for practicing designers to learn from each other in discussions that extend their proficiency and understanding of their practice.

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