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Communication Design Quarterly

ACM SIGDOC (Special Interest Group Design of Communication) seeks to be the premier information source for industry, management, and academia in the multidisciplinary field of the design and communication of information. It contains a mix of peer-reviewed articles, columns, experience reports, and brief summaries of interesting research results. *Communication Design Quarterly* (CDQ) is archived in the ACM Digital Library.

We invite you to contribute in any of the following areas:

- Peer-reviewed articles. Articles that cross discipline boundaries as they focus on the effective and efficient methods of designing and communicating information; disciplines will include technical communication, information design, information architecture, interaction design, and human-computer interaction.
- Experience reports. Experience reports present project- or workplace-focused summaries of important technologies, techniques, or product processes.
- Interesting research results. Short reports on interesting research or usability results that lack the rigor for a full article. For example, pilot studies, graduate student projects, or corporate usability studies where full details can't be released.

We are also interested in proposals for guest editing special issues. As a guest editor, you would be responsible for providing two peer reviewed articles on a specific topic and, potentially, coordinating with the column editors so their columns can complement the issue's theme.

Information about joining SIGDOC is available at http://sigdoc.acm.org/join/.

CDQ Editors

CDQ editorial

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The 3rd annual Symposium on Communicating Complex Information (SCCI) was held February 23-24 in Greenville, NC on the East Carolina University campus.

The symposium had 8 presentations plus Whitney Quesenbery's keynote talk. This issue of CDQ gives you four papers that expand on the presenters' talks.

SCCI explored the relationships between and within the contexts that affect complex information, information design, information architecture, user experience, and usability. The various papers examined how design choices influence people's behavior when interacting with complex information, and how the knowledge of situation contexts improved the design of complex information systems.

Recent scholarship in user experience and usability has called for a revamping of the methods we use when testing more complex systems or has encouraged us to develop a collaborative knowledge space so that we might better share our approaches and data. Part of CDQ's mission is to publish articles that contribute to that ongoing conversation.

More information about next year's symposium can be found at: http://workshop.design4complexity.com/

Besides the symposium papers, we have three columns and two book reviews.

Hope you enjoy and thanks for reading *Communication Design Quarterly.*

Notes from the Chair

Liza Potts

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Welcome to another issue of CDQ! We hope you enjoy the columns and articles, and we encourage you to submit your work. We welcome cutting edge, compelling work that seeks to push the limits of the design of communication as it is practiced and researched (the DOC in SIGDOC).

We are now nearly halfway through 2014, which means we are entering the busy quarter for our SIG: Conference paper time! By the time you read this issue of CDQ, our conference chair and program chairs will be in the thick of it, managing peer reviews and arranging our annual conference. We are looking forward to an exciting 2014 in Colorado Springs.

Below are a few of the top projects your board and volunteers are working on. We continue to work across organizations in technical communication, broaden our membership, and work to improve our SIG. Please feel free to contact any of your board members to get involved with these projects.

Continued Cross-Organizational Cooperation with CPTSC

This year's conference will be located in Colorado Springs, Colorado the day after the annual meeting of the Council for Programs in Scientific and Technical Communication (CPTSC). We encourage you to take this opportunity to learn more about CPTSC, participate in their conference, and network across our communities.

Women in Technical Communication

This year we once again co-sponsored the Women in TechComm luncheon at ATTW's annual conference. Our work continues as we work on mentoring and outreach. Our next steps include an event at our annual conference. As soon our plans come together, we will notify you through our email list, our conference websites, Twitter, and Facebook.

Bylaws and Operations for SIGDOC

A committee made up of board members and volunteers are working on updating our bylaws in accordance with ACM's guidelines. Many of these changes are small but important (for example, changing Chairman to Chair), and some of them may open up new opportunities for us (deciding whether to split the role of Treasurer/Secretary). Depending on the scope of these changes, you may be voting on our bylaws in the next election. Speaking of which…

Elections

We will soon put out a call looking for volunteers for our 2015 election. Do you have a vision for leading SIGDOC? Excited by our SIG and want to help us grow? Come join our leadership team. More later this summer!

If any of these initiatives interest you, please feel free to contact me. We welcome new volunteers, leaders, makers, and participants in our efforts to make SIGDOC a vibrant community of researchers and practitioners.

What's in a name? Experience Architecture Rearticulates the Humanities

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By describing cultural usability work as "information architecture," I knew I would be waging a continuous rearguard battle with database designers. Eventually the cost of bickering over turf outweighed the clarity the term brought, even considering its lineage. Richard Saul Wurman first recognized *Information Anxiety* in the late 1980s and described those working as *Information Architects* in the 1990s. Here, I remind readers that Wurman goes by the nickname "Ted." Wurman's vision of widespread attention to Technology, Education, and Design resulting in the popular TED talks—although he has an uneasy relationship with his own creation. "When he speaks about TED Talks, he clearly struggles to identify with the organisation today and is adamant that it has lost its vision." [http://www.universityobserver.ie/2012/10/31/interview-richard-saul-wurman-ted-talks/] At our current moment of media convergence, it helps to remember that the 20 minute flipped pedagogical lecture itself is the result of thirty years of dedication to disseminating disruptive ideas. If Ted Wurman can let TED go, I can let go of Information Architecture.

Hans Rosling's original TED talk from 2006, now with over 8 million online hits, continues to be a watershed in understanding designed experience. TED demonstrates both an existing audience for and a slow-burning long tail of social media. Rosling's presentation stands as a monument to designing the audience's experience: marshaling the available media to provoke specific responses in the minds of those observing.

In the age of media convergence, TED talks powerfully appeal to a wide audience. It is not unlike the relationship another Ted had with emerging technology. Visionary Ted Nelsen imagined Hypertext in the 70s. Nelson's hypertext is as important to the contemporary shape of the internet as Wurman's vision of a decentralized, human-centered vision of media. And the internet is as different from Nelson's Hypertext as TED is from Wurman's founding vision, and neither would exist without its visionary. Rosling's GapMinder is as influential to the development of time-based media and information-driven visualizations as Bush, Nelson, and Wurman. Without Rosling, real-time display and analysis of massive data sets would not be realizable. So I am asserting that Rosling inspired Big Data, or at least assert he is part of the assemblages that make the approach viable.

What's in a name? What's in an effectively designed user experience? Richard Stallman and Linus Torvalds comes to mind. Stallman speaks powerfully about open source software, the value of net neutrality, and the importance of the internet's gift economy. When asked about his continuing feud with Torvalds, Stallman assails the chief engineer of the Linux operating system distribution. For those unfamiliar with this ongoing debate, Richard Stallman asserts GNU is responsible for the core technology and Torvalds is adding a trivial add-on, and adjunct: the interface and user-centered installation experience. The group Stallman leads, GNU, goes so far as to encourage users to call the free operating system GNU/Linux. But like so many other visionaries, Stallman created a wondrous and powerful operating system that was completely inaccessible to the great majority of users—many of whom recognized they could benefit from the astonishing technology. Among other things, Torvalds architected a meaningful user experience around the innovative OS allowing millions access to use the amazing, powerful, free code. Torvalds wanted to be paid—paid not for inventing Stallman's code but for the less glamorous work of making that code accessible and usable for millions. In short, that is my argument for heralding Linux and its offspring as a disruptive breakthrough in understanding the contribution of experience architecture. The value of crafting an accessible experience architecture is not limited to open source software. Indeed, the Disney Corporation calls them *Imagineers*.

Besides, the inherent weakness of the term information architecture is a weakness akin to that of usability testing. Both imply linear design processes and neither recognize iterative or recursive design. And where usability testing has been routinely criticized for being an end-of-process adjunct, an afterthought, information architecture has been roundly discounted because of its non-practical, visionary, "creative" baggage. No real problem, really, but perception. And then the rhetorical analyst insists that these criticisms be taken seriously and understood as the damning deconstruction they are, particularly in the aftermath of the great recession and the hobbled economy in which those few surviving digital consultants are left working. If no less a light than Peter Morville has shifted away from *Information Architecture* to new emergent titles, like *Ambient Findability* and *Search Patterns*, while Louis Rosenfeld has gone the way of becoming a brand himself: Rosenfeld Media, which now publishes dozens of User Experience titles by over 60 authors. While it makes sense that much scrutiny is being placed on the titles of our fields of interests and the names we bestow on our specialties, their proliferation and multiplication become both intimidating and confusing.

Over a series of conversations, Liza Potts has convinced me that Experience Architecture, or XA, distinguishes academic discourse. Growing as it does from work (including some of mine) that utilized the term Information Architecture at the turn of the millennium, from the contested terrain of Usability, User-centered Design, UxD, Experience Engineering, etc., where the application of the concepts gather as many monikers as there are contexts of application.

At its heart, Experience Architecture is a humanistic disciplinary formation that gathers together technical and rhetorical skills. I am struck by the power of ancient rhetorical skills to effectively interact with new, emerging media. Experience Architecture provides access to contemporary digital tools, coupled to ancient wisdom that drives effective research practice, methodological inquiry, and long-term vision. And while I have no nostalgia for the early turn of the millennium bubble economy when students left school for unsustainably inflated salaries, it would be fine with me to have more companies committing to jobs with benefits and stability. But until (and if) these jobs (re)materialize, the entire community will have to continue to come to terms with the rigors of contract work and independent entrepreneurship – professional preparation like bookkeeping, project management, and budgeting beyond what might immediately come to mind as the curriculum of experience architecture, of technical communication, of technorhetoric.

Journey Mapping: A Brief Overview

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If you've been in the field of user experience design, usability testing, or marketing for anytime at all, you've almost certainly come across the use of personas to help members of a cross functional design team communicate with one another about the impacts that design decisions will have on a particular user demographic. As Adlin and Pruitt (2006) explain, personas are useful because they put an individual, human face on demographic and ethnographic data which would otherwise be difficult to explain to software engineers, project managers, information product developers, and other stakeholders in a way they can easily conceptualize and apply. Usually on one sheet of paper, a persona will provide a photo of the character for the persona; a memorable name for the persona; a short bio or background information about the persona; the persona's goals for using the product being developed; a short and memorable quote from the persona which usually conveys their *ethos;* and other information relevant to the use of the product being designed such as training; previous experience with similar products, or physical disabilities (such as arthritis or poor eye sight—see http://www.clemson.edu/caah/caah_mockups/persona_clemsongrad.html for an example of personas developed for the redesign of a College's website).

What Is a Journey Map?

Unlike personas which tend to focus on providing a static, two-dimensional snapshot of a particular user demographic, journey maps (also known as "experience maps" or "customer experience maps") have been growing in popularity in the UX field over the past 3–4 years because they add a third dimension to traditional personas by focusing on a diachronic outline of a user's experience with a product over time. As the name suggests, journey maps provide a graphic visualization or a map of a customer's or user's experience with the product and the business or organization which produced it. It maps significant changes in the user's needs, degrees of satisfaction with the product, or other use metrics across phases of the user's experience.

Journey maps evolved out the service design field (Stickdorn and Schneider 2012) where marketing and management professionals attempt to improve service organizations (e.g., a health care service or a financial consulting firm), and the designers try to create a blueprint for the organization's services. One of the visualization tools service designers used to begin their overall blueprint was a flowchart or map of the stages a customer goes through during their interactions with the organization. These flowcharts became "journey maps" and they would show, for example, how a car rental service customer might go through phases by first planning a trip, then move into a shopping phase to find rental services, then move into a selection phase where they compare rental service providers, and so on.

How Do You Create Journey Maps

Typically, journey maps display the major phases of a user's experience along a horizontal axis of the visual to show the progression of time. Along the vertical axis, designers will then add categories or metrics of particular interest to the organization. Usually for example, there is a section on the vertical axis which describes what the customer is doing during that particular phase. Additional categories or metrics can be added for issues like how the user is feeling during that phase, what needs or questions does the user experience at that phase, and so on. Chris Risdon (2011) provides a good example of this by illustrating the customer journey of a person traveling by rail in Europe (see http://www.adaptivepath.com/ideas/the-anatomy-of-an-experience-map/). The main take-away here, however, is that the real artistry and power of journey mapping comes from the creativity that goes into the metrics your team can imagine. How well the journey map is able to illustrate your user's experiences ultimately depends on the touchpoints which your team is able to collect and connect together visually.

Why Use Journey Maps?

There's increasing anecdotal evidence that the use of personas alone aren't effective at putting the priority on users during the design process. Indeed, in her award winning research at the 2012 CHI conference, Erin Friess (2012) showed that industry teams only invoked the personas that their companies had developed 3% of the time while making design decisions about their products. Journey maps are one way to address that problem because they add a 3rd dimension to the 2-dimensional static profiles personas offer. Journey maps offer a high-level overview of all of a user's interactions with your company in a way which keeps the user's experience with each touchpoint on the journey map in front of product managers, software engineers, marketers, and other key stakeholders on your design team. So they are increasingly becoming a valuable tool for communication and collaboration in the user experience professional's toolbox.

Works Cited

Friess, E. (2012). "Personas and decision making in the design process: An ethnographic case study." ACM CHI '12. Archival Research Papers on Human Factors in Computing Systems, pp. 1209-1218.

Pruitt, J. & Adlin, T. (2006). The Persona Lifecycle: Keeping People in Mind Throughout Product Design. San Francisco: Morgan Kaufmann.

Multimedia Authoring Teaching & Research Facility. (2009, January 1). College of Architecture, Arts and Humanities (CAAH) Website Mock-Ups. Retrieved May 1, 2014, from http://www.clemson.edu/caah/caah_mockups/index.html. 2009.

Risdon, C. (2011, November 30). The Anatomy of an Experience Map | Adaptive Path. Adaptive Path. Retrieved May 1, 2014, from http://www.adaptivepath.com/ideas/the-anatomy-of-an-experience-map/.

Stickdorn, M., & Schneider, J. (2011). This is service design thinking: basics, tools, cases. Hoboken: Wiley.

(Author's Note: Thanks to Dr. Alicia Hatter, Senior Usability Engineer at Vanguard Corp., for providing her insights into how UX practitioners are using journey maps.)

Participatory Design: Barriers and Possibilities

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Column

Scholars conducting analytical research in multimodal interaction design have not paid enough attention to the use of disabled participants in their work. In this column I argue that participatory action research with these users is overdue for the sake of building a culture of accessible designs. Working on a larger project on participatory design for a book, this commentary records my initial thoughts on how participation by disabled users needs to be central to the overall production cycle. I begin with the premise that each disabled user participates in this multimodal discourse from an entirely different vantage point shaped by their social, physical, and artistic experiences. It also emphasizes that each user interacts with multimodality differently depending upon the body they have, the adaptive technology they employ, and the uses they have for multimodality.

While retrofits appear to be a reasonable technical solution, they place the disabled users in the "other" category, push their needs to the margins in the eyes of designers and developers, and continue to encourage investment in often ineffective solutions. Disabled users with sensory disabilities primarily interact with multimodal web-design through retrofit technologies, such as, screen readers, Braille displays, voice-input systems, and especially-designed pointers. At this time, most developers expect adaptive technology to bridge the gap between the disabled user's needs and their products' missing accessibility. This relational dynamic between developers and adaptive technology designers results in a mismatch between what developers expect and what adaptive technology can deliver. The developers often think that screen readers, by virtue of being a retrofit adaptive technology, should serve as they want without realizing the limitations of adaptive solutions. In a great many situations, the screen reader's job becomes that of a virtual hotel maid who cleans up after the software designers and web developers have left after finishing their exclusionary projects. I need not mention that while these retrofits with a set number of fixes for interaction might be simpler to design, they lack the options for more complex interactions, offer far fewer interactive features relative to what is available to nondisabled users, and often lack proviso for helping the users correct themselves in case of error. By their very nature, retrofits are inferior to the interface-level access built into the design. Since they are an afterthought, they can at best be provisional fixes. Moreover, they are chosen by vendors uninterested in considering this disabled group among their primary consumers. As Nardi (1997) states, today's complicated, interactive systems should not be researched, designed, or tested in laboratories in isolation from the actual users; they demand a participatory process at all stages of design, development, and deployment. When we carefully examine the huge financial and social costs of adding retrofits to existing digital systems primarily designed for the able-bodied consumer, participatory design does not appear a burden. Interface-level accessibility designed through a participatory process at every level of the product development cycle not only serves disabled consumers well, it also enhances usability for the majority, including the elderly, young, and novice. Selber, Eilola, & Mehlenbacher (1996) point out that "[u]sable systems are accessible, maintainable, visually consistent, comprehensive, accurate, and oriented around the tasks that users must perform." Oskarsson and Glass (1996) also remind us that the quality standard for designing software, ISO 9000-3, aims at providing complete specifications that include all customer requirements."

In practical terms, accessible and usable designs are not only possible through direct involvement of disabled participants but also easier to develop. For example, many Apple products now have accessibility built into their operating systems, even though their usability has not yet been fully evaluated. At the same time, designing an accessible user interface in an operating system does not necessarily allow a disabled user to realize the full potential of a product. Apple products are once again an example of this troublesome phenomenon. In spite of the fully accessible IOS interface of a contemporary iPhone, a majority of available apps for these multipurpose devices are not designed to be accessible or usable by persons with disabilities.

The tenets of user-centered design also advocate participatory approaches and these approaches are probably far more applicable in disability contexts than anywhere else because the designers of popular consumer devices rarely interact with users with serious sensory disabilities, such as, blindness and deafness. These designers and developers seldom have training in accessibility standards. When the designers do perform laboratory tests with disabled users, such engagement comes toward the end of the product cycle when significant changes in design are impossible to implement. Moreover, these participants have little role in designing these laboratory tests and it is hard to determine whether or not the tests have covered all the user-need areas. Even at this late stage, the disabled participants are rarely involved in the analysis of data from these laboratory tests. Consequently, these designers and developers miss the valuable opportunity of conceptualizing the design from these users' perspective at the point of inception (Tufte, 1990; Nardi, 1997; Newell & Gregor, 1997; Johnson, 1998).

Participatory design approaches from the bottom up are central to delivering systems built on accessible interfaces with the potential of delivering service to a range of users. Not only do the designers and developers know very little about how disabled users interact with digital technologies, they also have little exposure to adaptive technologies.

At least two types of technologies are deployable for enhancing usability and accessibility for blind users of multimodal technologies; 1) ones that try to make incremental progress in designing solutions and have been argued for by researchers such as Lazar (2007, 9) and 2) the ones that aim at devising altogether new system designs proposed by researchers such as Cooper and Heath, (2009); Seale and Cooper, 2010; Zhao, Shneiderman, & Plaisant, (2007); and Evers & Hillen (2007). For example, Evers & Hillen's NavAccess application permits users to preview the high level navigational structure of a web site without concurrently listening to the page content.

The technologies that can be likely candidates for improving interface-level usability of multimodal systems must possess these features:

1. Disabled users ought to be able interact with it independently.
2. The designers of mainstream technologies need to be fully conversant with adaptive technologies and their designs must lend to perfect machine-to-machine interactions with these adaptive technologies. For example, we need technologies that can render information serially to match the linear nature of screen readers and not require simultaneous attention to more than one interaction in different work areas on a digital display in a quick succession. Currently, no dependable point-and-click system exists to support such actions for the blind.
3. When the dynamic nature of multimodal display of information in certain situations prohibits 100% mechanical interaction with adaptive technologies, designers must employ alternate adaptive technologies to fill this gap. For example, when a multimodal webpage is impossible to render on a Braille display, designers may consider haptic and other tactile technologies to represent such audio-visual information. These novel technologies have already been experimentally deployed in virtual reality prototypes at the MIT Media lab and possess the potential of delivering the more dynamic features to the blind user (Merrill & Selker, n.d.). These are the most promising technologies at this time which can solve the interactive navigational challenges presented by the limitations of the dynamic, multimodal designs. In online environments, these tactile interfaces can permit blind users to respond to the system demands for data input and confirmation commands more efficiently, can allow personalized and context-specific interactions to perform more complicated decision and action steps, and make other multimodal features available. If the affordances of these relatively under-explored tactile technologies are put to work with minute attention to different aspects of multimodality, they can bestow many opportunities to improve human-computer interactions with multimodal designs.

Works Consulted

Cooper M., & Heath, A. (2009). Access for all to e-learning. In A. Méndez-Vilas, A.S Martín, J.A. Mesa González, & J. Mesa González (Eds.), *Research, reflections and innovations in integrating ICT in education* (pp. 1139-1143). Milton Keynes, UK: Open University Press.

Evers, V., & Hillen, H. (2007). Online redesign of a website's information architecture to improve accessibility for users who are blind. In: Lazar, J. (Ed.), *Universal usability: Designing computer interfaces for diverse user populations* (pp. 93-140). Chichester, UK: John Wiley & Sons.

Fischer, G. (2000). Symmetry of ignorance, social creativity, and meta-design. *Knowledge-Based Systems*, 13(7), 527-537.

Fischer, G. (2001). User modeling in human–computer interaction. *User modeling and user-adapted interaction*, 11(1-2), 65-86.

Johnson, R. R. (1998). *User-centered technology: A rhetorical theory for computers and other mundane artifacts.* Albany: State University of New York Press.

Kintsch, W. (1998). *Comprehension: A paradigm for cognition.* Cambridge, UK: Cambridge University Press.

Lazar, J. (Ed.). (2007). *Universal usability: Designing computer interfaces for diverse user populations.* Chichester, UK: John Wiley & Sons.

Merrill, D., & Selker, T. (n.d.). A vibrotactile system for feeling the depth of digital images. Massachusetts: MIT Media Lab. ND. Retrieved from: http://alumni.media.mit.edu/~dmerrill/publications/dmerrill_hapticheightmap.pdf

Miele, J.A. (n.d.). Tactile map automated production (TMAP): Using GIS data to automatically generate raised-line street maps. San Francisco, CA: Smith-Kettlewell. http://www.ski.org/Rehab/TMAP/

Nardi, B. A. (1997) "The Use of Ethnographic Methods in Design and Evaluation." In M. G. Helander, T. K. Landauer, & P. V. Prabhu (Eds.), *Handbook of Human-Computer Interaction, Volume 1*, Elsevier Science B.V., Amsterdam, pp. 361-366.

Newell, A.F. & Gregor, P. (1997). Human computer interfaces for people with disabilities. In M. G. Helander, T. K. Landauer, & P. V. Prabhu (Eds.), *Handbook of human-computer interaction, Volume 1*, (pp. 813-824). Amsterdam: Elsevier.

Newbigging, E.D., & Laskey, J.W. (1996). Riding the bus: Teaching an adult with a brain injury to use a transit system to travel independently to and from work. *Brain Injury*, 10(7), 543-550.

Norman, D. A. (1988) T*he Psychology of Everyday Things*. New York: Basic Books.

Oliver, M. (1992). Changing the social relations of research production?. *Disability, Handicap and Society*, 7(2), 101–114.

Oskarsson, Ö., & Glass, R. L. (1996). An ISO 9000 approach to building quality software (p. 126). Prentice Hall.

Repenning, A. (2000). AgentSheets. Retrieved from: http://www.agentsheets.com

Schön, D. A. (1983) The reflective practitioner: *How professionals think in action* (Vol. 5126). New York: Basic Books.

Schuler, D., & Namioka, A. (Eds.). (1993) *Participatory design: Principles and practices*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Schloerb, D. W., Lahav, O., Desloge, J. G., & Srinivasan, M. A. (2010, March). BlindAid: Virtual environment system for self-reliant trip planning and orientation and mobility training. In Haptics Symposium, 2010 IEEE (pp. 363-370). Waltham, MA: IEEE. http://hdl.handle.net/1721.1/62165

Seale, J., & Cooper, M. (2010). E-learning and accessibility: An exploration of the potential role of generic pedagogical tools. *Computers & Education*, 54(4), 1107-1116.

Selber, S. A., Johnson-Eilola, J., & Mehlenbacher, B. (1996). Online support systems. *ACM Computing Surveys* (CSUR), 28(1), 197-200.

Tufte, E. R. (1991). Envisioning information. Optometry & Vision *Science*, 68(4), 322-324. Cheshire, CT: Graphics Press.

Communicating Complexity in Transdisciplinary Science Teams for Policy:

Applied Stasis Theory for Organizing and Assembling Collaboration

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ABSTRACT

This paper presents an application of stasis theory for the purpose of consulting with interdisciplinary teams of scientists working in the early stages of composing a science policy advisory document. By showing that stasis theory can be used as an organizing conceptual tool, we demonstrate how cooperative and organized question-asking practices calm complex interdisciplinary scientific disputations in order to propel productive science policy work. We believe that the conceptual structure of stasis theory motivates scientists to shift their viewpoints from solitary expert specialists toward that of allied policy guides for their advisory document's reader. We further argue that, through the use of stasis theory, technical writers can aid interdisciplinary scientists in policy writing processes, thus fostering transdisciplinary collaboration.

Categories and Subject Descriptors

H.0 Information Systems: General

General Terms

Documentation, Design, Management, Human Factors, Theory

Keywords

Stasis Theory, Applied Rhetoric, Science Policy, Science Communication, Conceptual Structure

INTRODUCTION

When social and environmental policy makers consult with scientists to address complex problems, these scientists can be seen as rich silos. Within them, important knowledge is stored away, not fully available due to isolating practices in discipline-specific discourse. A lack of common language and procedure—incommensurability—drives this isolation, which often impedes technical communication in complex projects (Harris, 2005). Derek Ross (2013), writing for the Association for the Teachers of Technical Writing blog, echoes this technical communication difficulty. Ross notes that many scientists find "targeting different audiences and effectively shaping information" very difficult. Struggling to inform interdisciplinary policy with expertise, many scientists feel pigeonholed by their very professional training and academic background. Yet, science expertise is absolutely essential in addressing public health and disease, energy and climate, conservation of biodiversity, and sustainable agriculture.

Alan Gross (2006) asserts that, for observing and analyzing incommensurability between scientific disciplines, stasis theory is an appropriate methodology. Drawing from technical communication consultation, we argue that introducing stasis questions from classical rhetorical theory into policy writing practices can help organize interdisciplinary teams charged with developing policy. Stasis theory is a rhetorical method for learning the taxonomy of questions that clarify a situation. While stasis theory, in classical times, was primarily understood as a tool for inventing arguments, in contemporary times, stasis theory is resurfacing as a way of organizing and analyzing both science arguments and science findings (Fahnestock, 1986; Gross, 2004). Jeanne Fahnestock and Marie Secor's (1985) modern interpretation of stasis theory distills the classical questions one can ask about a subject into five central categories, or stases: conjecture, definition, cause/effect, value, and policy. If presented with statistics regarding the overall increase in temperature of the Earth's atmosphere, for example, we can first ask "What is going on?" (conjecture), then proceed to ask "What should we call this phenomenon?" (definition), "What are its causes and what will result from it?" (cause/effect), "What harm can the results pose?" (value), and "What can, should, or must we do about global warming?" (policy). Disputes over global warming, in essence, address questions like these. One might argue, for example, that we ought to call the increase in temperature of the Earth's atmosphere "climate change," rather than "global warming," and proceed to provide reasons for this definition. Another person may argue that "anthropogenic" carbon emissions are a primary cause of the phenomenon, while her adversary may counter-claim that the primary cause is a 200-year cycle of solar radiation. Chiefly, any argument may reside in one of the five stases.

Furthermore, these five stases are hierarchical, i.e. one cannot propose a policy about a phenomenon without first knowing what it is, what it is called, what its causes and effects are, and what its value is. As we will demonstrate, this hierarchical aspect of the stases can frame stasis theory as a conceptual structure for designing and producing a white paper, a testimonial, or any other sort of policy advisory document. Based on a case study from a recent technical communication consultation, we show how introducing

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stasis theory early into an interdisciplinary science environment motivates participants invested in answering the stasis questions to collaborate toward the final stasis of policy.

We believe that a stasis-structured policy writing collaborative demonstrates a transdisciplinary, rather than interdisciplinary, effort. In asserting that applying stasis questions in teams fosters transdisciplinarity, we borrow from Brandt et al. (2013), who define transdisciplinarity as "a research approach that includes multiple scientific disciplines (interdisciplinarity) focusing on shared problems and the active input of practitioners from outside academia" (1). A transdisciplinary approach affirms our belief in the inherently equal value that discipline-specific scientists, as well as non-scientific specialists such as technical communicators and citizen stakeholders, bring to policy development.

This paper offers a contemporary model for using the conceptual structure implicit in stasis theory as an organizing tool for designing the collaborative composing process of complex policy paper writing by interdisciplinary teams of scientists. We introduce a case where Marybeth Shea mediated a stalled yet collegial interdisciplinary team of scientists charged with developing a governing policy document on the safety of over-the-counter dietary supplements. We analyze this consultation, explaining how stasis theory was deployed to fit this case. By teaching the science team about stasis theory, Shea helped them arrange and organize their knowledge, fostering comfort and calmness to the high stakes, hectic, and complex situation. We conclude our paper with consideration of difficulties that may result in transdisciplinary applications of our stasis approach. We invite other technical communicators to consider stasis theory as a powerful tool in approaching complex information design.

STALLED SCIENTISTS IN A COMPLEX SITUATION

In September 2009, Shea was contacted by an interdisciplinary team of U.S. federal government scientists working to evaluate the safety of natural compounds in over-the-counter dietary supplements. Initially, the group requested Shea's help in arranging and editing their science writing to create a policy document that would act as a testimonial regarding the human health and safety of these "natural" consumer products. The team included a biochemist, two toxicologists, a psychopharmacologist, an animal science specialist, and a botanical anthropologist. The team also included a liaison person with regulatory, legal, and economic expertise who managed the "docket hand-off," or the transfer of the testimonial document, to the rulemaking authority within the U.S. federal government. This liaison-official held both a medical and public health degree, with years of federal experience in regulatory and legislative biomedical science rulemaking.

When Shea began consultation, she noted a collegial yet non-productive atmosphere, where different scientists from the interdisciplinary team would question and even undercut one another because of fundamental differences in discipline-specific methods and standards of evaluation. Progress stalled because of lively disagreements over findings and studies. Aside from these disagreements, scientists in the team expressed, often privately to Shea, discomfort using research and testing methods from other, albeit allied, fields. Meeting time was spent proposing an idealized system for a shared set of procedures and methods that all the members of the interdisciplinary team would uphold. The details of this proposed universal scientific method, however, were nebulous and elusive more than pragmatic and unifying.

For about a month, Shea observed the work atmosphere and helped to organize and to edit the little writing that the group had done. Recognizing that the group's internal discussion was not productive but, instead, creating discomfort, Shea introduced these scientists to the classical rhetorical method of stasis. Shea taught the group five stases (conjecture, definition, cause and effect, value, and policy), formulated in terms of questions (see figure 1). Twice a week for six months, Shea held three-hour-long workshops, in which scientists discussed and adopted the relevant stasis questions. Individuals were encouraged to focus on answering one stasis question at a time. Opportunities for moving between stases would come in the writing revision work, which was conducted regularly. By working through stasis questions, these scientists moved the science forward by harnessing the hierarchical aspect of stasis theory to promote a sense of genuine progress.

In order to ensure that she was not imposing an ill-fitting hierarchy onto the team, Shea proposed that each scientist self-assign her- or himself to a particular stasis question. The biochemist, for example, dealt with the first two stases (conjecture and definition) because his knowledge permitted enumeration of the chemical properties of the molecules and compounds in the supplement, as well as classification of the supplement, in term s of shared chemical properties with other similar biological material. The botanical anthropologist also addressed the first two stases (conjecture and definition) by providing culturally significant background information regarding the plant used in the dietary supplement; she did this by consulting ethnographic narratives and data, culturally-situated medicinal texts, and pharmacognostic documents to create a comprehensive, detail-rich problem description. The psychopharmacologist chose to address questions of cause and effect by looking at the relevant data and clinical cases regarding dose and ingestion of the supplement. From this research, he cross-referenced these findings with similarly classified supplements, drawing from the classificatory work of the biochemist. The botanical anthropologist, then, supplied information about how the plant source of the supplement is used for medicinal, cultural, and dietary purposes by an indigenous population, thus addressing evidence of safety and answering the central question of the stasis of value. The two toxicologists and the animal scientist also wrote on value, addressing questions about the potential harm that may come as the result of ingesting particular chemicals active in the supplement. Finally, the regulatory liaison, who had both legal and economic expertise, addressed the question of the stasis of policy, using the facts supplied by the scientists on the team.

Shea, by introducing stasis theory, not only helped the team to design and organize their policy document but also provided an outlet for both expressing frustration and fostering goodwill. Though mannered and civil, the initial interdisciplinary discussion revealed disciplinary rivalries. This particular science team enjoyed a collegial intimacy, reflecting a degree of trust established over several years of joint work; additionally, team members were interpersonally very compatible. However, even given this good will, team members expressed frustration privately to the consultant as part of individual conversations. Answering stasis questions provided a group atmospheric calming in the policy deliberation terrain. Shea received private, positive feedback from the biochemist and botanical anthropologist on the team. "My work in molecular identification is not often respected by the

	Example Question	Scientist(s) Involved
Conjecture	Where does the supplement come from? What exactly happens when the supplement is ingested?	Vetting of the plant material species by botanical anthropologist; biochemical pathway by biochemist
Definition	What are the component parts of the supplement?	Biochemist first identifies the bio-active compounds, later attesting to their integrity in manufacturing process; work confirmed by botanical anthropologist, regarding known companion compounds by plant species
Cause/Effect	What does the supplement do, and why does it do this?	Botanical anthropologist on “history of use”: psychopharmacologist for biomedical pathways
Value	Are the effects of the supplement harmful or benign?	Toxicologists (2) and animal scientist who look at doses in animal model studies
Policy	Can we say that it is safe to ingest, and to what degree of certainty?	The summation document is vetted by the regulatory specialist.

Figure 1: The Stases. Each stasis is aligned with an example stasis question and a scientist or a group of scientists who worked on answering the question.

experimental scientists who test hypotheses in large sample sizes,” explained the biochemist. He appreciated his refreshed role in the deliberative process, rather than making footnotes about molecular identity. “Thank you!” exclaimed the botanical anthropologist. “Ethnographic knowledge and method is perfect for the first stasis. I am so pleased that we began our team deliberation with this important background knowledge.”

Further conversation with these two scientists centered on how modern scientific practice, since the rise of frequentists statistics, often prefers hypothesis testing in a designed experiment, typically with large sample sizes for populations or trials. Most of the other scientists in the group would characterize their disciplines as deeply experimental, with the toxicologists and animal scientist as prototypical. The biochemist and the botanical anthropologist are in disciplines that use patterns of interrogation to identify molecular classes of biological material or to identify a plant species. This highly descriptive scientific practice fits quite well with the second stasis of definition, as well as the first stasis of conjecture, where a narrative approach is typical. The self-assignment of stases, then, frees up team labor to further research experimental data, including the inclusion of meta-analyses into their phase of the third stasis of value or value assessment. Furthermore, the botanical anthropologist’s narrative description of the plant material that the supplement comes from, which was implemented in the final document design, acted to make the policy document accessible to audiences.

Writing policy documents in interdisciplinary science groups is problematic precisely because each discipline singles out and evaluates specific aspects of the world in ways that are relative to discipline experts. From our case study, one can see that the introduction of stasis theory can act as an organizing tool for approaching large-scale policy document composition with interdisciplinary scientist teams. Whereas before introduction of the stasis approach, each team member attempted to use his or her knowledge in order to arrive at the ultimate, robust testimonial, thus leading to conflicting accounts on how best to reason, collegially, to the conclusion, through the stasis questions, each team member saw his or herself as only part of the policy reasoning process. Because each member was only asked to answer stasis questions that he or she was comfortable answering, the stases as a conceptual model—beginning with conjecture and ending in policy—worked to divide the labor of the team. The stasis questions changed the work discourse from one that focused on finding commonalities between scientific methods and findings—for joint arrival at a policy statement—to a discourse that imagined each scientist as answering only the questions that they were certain of, could speak about with confidence, and would have no problem spending time and energy articulating to the best of their ability.

One reason we believe that the stasis approach worked so well is because the primary conceptual structure implicit to stasis theory is one that most individuals tacitly hold and one that reframes the goal of composition from telling the objective truth to providing helpful information for a particular policymaking audience. Within the cognitive sciences, the term image schema is used to denote structures that help give shape to basic, recurring cognitive processes (Lakoff, 1987). Such image schemas usually arise from bodily interaction with the world and, thus, are considered seminal parts of embodied cognition. We posit that the whole of our organizational model of stasis theory works through the combination of three kinds of image schema: the container schema, the link schema, and the source-path-goal schema.

Within our model, we build five container image schemas. Container image schemas help to organize abstract thoughts and structure them into kinds of architectural containers, replete with borders, an inside, and an outside. Each container represents a stasis or set of stasis questions and contains knowledge pertinent to that particular stasis within the “bin.” This idea of thinking of the stases as locations or “sorting bins” for arguments is commonplace in both classical and contemporary iterations of stasis theory. Though largely abstract, container image schemas that help structure the concept of the stases create an internal schematic structure that posits that some pieces of knowledge are central to the stasis container, while some are exterior. If a piece of knowledge is exterior to a particular stasis container—e.g., if learning about the effects of a rat liver toxicological study doesn’t tell us much about the definitional components of the supplement—then a scientist can reason that that particular piece of information should be categorized in a different stasis. In this way, everyone’s ideas about the supplement can find a place within certain categorical containers, thus organizing the scientists’ information to answer specific questions.

The second and third image schemas central to the organizational stasis process—the link image schema and the source-path-goal image schema—work together to create a sense of progress in the question-asking process implicit in stasis theory instruction. The link image schema posits that two objects (in this case, containers) are linked. For example, the conjecture container is linked to the definition container, and the definition container to the cause/effect container, and so on until we reach the policy container. This series of links, furthermore, creates a path, with a source (a starting point) located at the conjecture container and a goal (the ending point) located at the policy container. As we sort ideas, ask questions, and locate ourselves on this linked path, our goal is to get to the policy container, but we can only do so by answering the questions that allow us to progress forward on the path.

The smaller labeled boxes represent container schemas, the arrows indicate links between containers, and the large labeled box indicates the source-path-goal schema that structures the motion from conjecture to policy.

The benefit of using stasis theory as an organizing tool for science teams is that the theory can be taught in a way that simultaneously organizes and maps scientific knowledge onto a path composed of stasis containers. The stasis model expressed in Figure 2 not only helps to organize ideas but also helps to organize the policy paper into a user-centered document. At any given point in the nutritional supplement policy document, discussed in our case, the audience will have been given all the necessary knowledge—of what the supplement is, what it does, whether it's harmful—in order to justify the ultimate policy statement of whether the supplement is safe or not to ingest, from a scientific standpoint. This is information that the user obtains by walking down the path toward the policy goal. The stasis categories act as conceptual landmarks on the path toward the policy; they help to organize thought and direct travelers toward the final policy destination. Furthermore, stasis theory requires each person in the science team to imagine him or herself as tour guides on this conceptual terrain. They provide information for the travelers—i.e., the policy decision-making audience—that will help them to move from one stasis landmark to the next. Not wanting someone to get "stuck" or "lost" in the process of coming to the science team's final policy conclusion, the members in each stasis write to a common perceived audience, the traveler, thus shifting the group's argumentative focus from the absolute truth of science to the most relevant and helpful information for travelers to get from, say, cause and effect to value questions.

This idea of the stases as a conceptual mapping tool is explored by Turner (1991), but Turner's work, like many others who have used stasis theory as a mapping tool, address mapping arguments, rather than support the designing of collaborative documents. Whereas argumentation implies people in disagreement, the version of stasis theory we advocate for interdisciplinary science policy writing finds individuals acting as allies and co-collaborators in guiding readers to the ultimate policy decision stasis. Furthermore, members of the science team do not see themselves as facilitators or enforcers of reason, as they are not arguing with one another on the conceptual path toward policy, but rather as handmaids to the audience members for whom their writing serves. Such a role is precisely how Leibniz (1934), one of our forefathers of science and mathematics, imagined the role of the scientist in society: to help us "to march together and in order, to share our journeyings, to make known the roads and to repair them…" (p. 238).

CONCLUSION

Drawing from this supplements case study, we believe that applying our model of stasis theory can be an effective way to organize science teams in order to assemble policy advisory documents. While we demonstrate how implementing a stasis conceptual model helps to organize a team of collegial scientists, more work needs to be done regarding the implementation of the model for more diverse teams working with more structurally complex scientific phenomena. While we predict that the model will organize and thus calm the complexity of the scientific process leading up to policy writing, we believe a number of questions remain. For example, what does having scientists and nonscientists do for distinguishing disciplinary boundaries and methods? What sorts of team-building activities must be implemented to have diverse scientific and nonscientific teams work with one another in a way that avoids the back and forth disputation that causes anxiety and impedes productivity? At what point do different educational backgrounds become problematic for work teams? Furthermore, what collegial agency will the science communicator or technical writer be granted in such a team?

These are all questions we now grapple with as we begin working with scientists and farmers on a new project dealing with developing a best practice environmental standard on bio-remediated noxious emissions of air pollutants from poultry production on the Eastern Shore of Maryland. We hope to use stasis theory to again organize teams to calm the complexity inherent in the process of interdisciplinary scientific policy work. Like the dietary supplement team described, the poultry house pollution team we are currently working with is charged with writing a

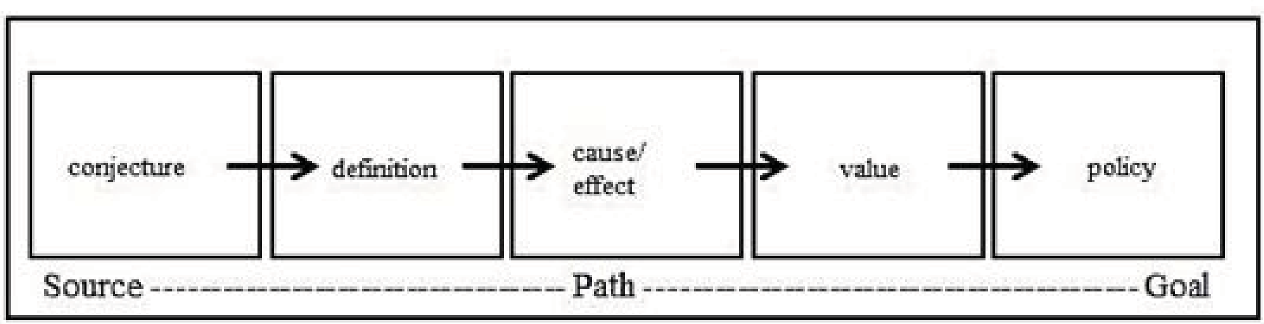

Figure 2: Conceptual Structure of Stasis Theory

summary science document toward a policy-governing stakeholder audience. And, like the dietary supplement team, this poultry house pollution team includes expert-members with varied disciplinary background—approximately 12 members in five institutions, with expertise ranging from poultry science and agricultural engineering to bioremediation and horticulture, as well as an environmental monitoring sub-team with expertise in hydrology, water chemistry, airborne emissions pollution analysis, and other specialised knowledge.

One chief difference between the dietary supplement team and the poultry house pollution team, however, concerns the inclusion of poultry farmers in the development of a policy document, namely, the drafting of a voluntary best practices environmental standard. This means that a stakeholder audience of non-scientists will participate in the very document writing process that, in another team setting, would exclude them altogether. Whereas the farmer audience is like the audience in the above case study—i.e., guided by scientist tour guides toward a reasoned policy decision—in this document construction process, the farmer audience would have the additional role of acting as a tour guide. Allowing for farmers and scientists to both play the role of policy tour guide can create a potentially complex and problematic situation. If that complexity is calmed by identifying that both the scientists and farmers are working on answering the same stasis questions, however, the process may create a transdisciplinary work atmosphere, one that benefits both scientists and farmers invested in the resulting policy.

These specialists, furthermore, will be working closely with non-scientist farmers, which may create problematic cultural riffs in teamwork, and, like in the dietary supplement case, yield a nonproductive group environment. One possible cultural solution, as King (2012) asserts, is to stress the importance for scientists, specialists, and experts to recognize and then yield some of their ethos to non-academic stakeholders, as well as non-academic disciplines and activities.

While this group environment is considerably more complicated than the dietary supplement team's, we hope to test and expand our stasis approach to team design for the purpose of developing not only interdisciplinary scientific policy creation but also teams that are inclusive of all stakeholders. Such teams can be renewed in their willingness to embark on the journey through an increasingly complex, interdisciplinary scientific terrain toward the goal of transdisciplinary science policy.

REFERENCES

Brandt, P., Ernst, A., Gralla, F., Luederitz, C., Lang, D. J., Newig, J., & Reinert, F. (2013, August). A review of transdisciplinary research in sustainability science. *Ecological Economics, 92*, 1-15.

Fahnestock, J., & Secor, M. (1985). Toward a modern version of stasis theory. In C. Knuepper (Ed.), *Oldspeak/newspeak: Rhetorical transformations* (pp. 217-226). Arlington, TX: Rhetoric Society of America.

Fahnestock, J. (1986). Accommodating science: The rhetorical life of scientific fact. *Written Communication, 3 (3),* 275-296.

Gross, A. G. (2004). Why Hermagoras still matters: The fourth stasis and interdisciplinarity. *Rhetoric Review, 23(2),* 141-155.

Gross, A. G. (2006). *Starring the text: The place of rhetoric in science studies.* Carbondale, IL: Southern Illinois University Press.

Harris, R.A. (2005). *Rhetoric and Incommensurability.* Anderson, SC: Parlor Press.

King, K. (2012). *Networked reenactments: Stories transdisciplinary knowledges* tell. Chapel Hill: Duke University Press.

Lakoff, G. (1987). *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago, IL: University of Chicago Press.

Leibniz, G.W. (1934). Miscellaneous extracts from Leibniz's philosophical writings. In M. Morris (Ed., Trans.), P*hilosophical Writings* (pp. 231-270). New York, NY: E. P. Dutton & Co, Inc.

Ross, D. (2013, September 3). Sharing expertise and bridging cultures: Communicating with scientists about communicating science [Web log post]. Retrieved from http://www.attw.org/blogs/bulletin/sharing-expertise-and-bridging-cultures-communicating-scientists-about-communicating

Turner, M. (1991). *Reading minds: The study of English in the age of cognitive science.* Princeton: Princeton University Press.

“That Usability Course”: What Technical Communication Programs Get Wrong about Usability and How to Fix It

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ABSTRACT
The approach to usability adopted by many technical communication programs often conceptually separates usability from other subject matter areas and places it at the tail-end of a project. Such an approach creates conceptual barriers with regard to how usability fits in a design project. As a result, students do not engage in the critical work of designing and testing iteratively in the formative phase of a product. We should broaden usability into user experience, enable students to see user experience as an iterative and agile process, and provide in-depth knowledge of user research methods.

Categories and Subject Descriptors
H.0 Information Systems: General

General Terms
Design, Human Factors

Keywords
Usability, user experience, design, prototyping, technical communication

INTRODUCTION
In most technical communication programs in the U.S., a conversation about usability in the curriculum typically goes in the following way: We need to add usability to our curriculum. Let’s hire a “usability person” and create a usability course. While usability is a buzzword, it is often conceptually separate from other subject matters. Students have such views as a “usability course” versus “non-usability” courses. Faculty members are referred to as “the usability person.” Evaluators check if a student has grasped user-centered design by checking if that student has successfully completed “that usability course.” Too often, incorporating usability means adding a course, a class session, or a chapter on usability. Usability seems “contained,” separate from the broad contexts of its application.

In a typical usability course, for instance, students conduct a usability test of an existing or finished product. This product is often chosen by students or given by a client. Students then create usability protocol, recruit participants, run the usability test, and write a final report. In this scenario, usability is practiced strictly as testing. It is regarded as a summative activity at the tail end of writing and design processes.

While testing has its place, this approach of framing usability creates conceptual barriers. Specifically, I see the following problems that stem from this approach:

- Students do not engage in the critical work of designing and testing iteratively in the formative phase of a product. Work occurs solely between receiving a finished product and handing testing results to the client. Due to the length of a typical semester, students develop a common view that “we test a product but we don’t build anything in this course.” This view is a misunderstanding of the value of usability and is counterproductive to students’ career endeavors in usability. After all, usability findings inform the next phase of design and translate into design revisions. Testing is the temporary end of one design cycle and the beginning of the next cycle. In other words, learning has just begun at this point.
- Students do not have the opportunity to observe how a product is designed with user in mind, and participate in the workflow and management of user experience projects. It is as if design is not part of the broader field of usability. It makes students see usability as a low-level technician type of work with little agency.
- Another deeper trouble is that students do not understand how user experience fits in an organizational setting. Often, they are not taught how user experience relates to business objectives and strategy, and how to advocate for a reasonable budget and staff for user experience. A gap exists in the critical intersection among user experience, business strategy, marketing, and innovation.
- Since the product students test in a course can be anything they find (often on the Internet), students have little prior knowledge about the product’s user goals and business objectives. They cannot effectively relate to the priorities of the product and the context of use. Assumptions are made for the sake of completing the projects in a course. In recruiting, compromises are often made due to the limited access to different types of users. Many usability courses use other students as participants, even when college students aren’t the target user population.

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- Usability courses are usually considered upper-division, at 400 or 500 levels. This means that students don't even take the course until the third or fourth year of their study. By then, they have gotten used to designing and writing without systematic knowledge about user experience. I have taught courses in writing for the web and document design. Conceptually, students separate usability and non-usability courses. From my observation, students don't think about usability until their product is nearly finished because that's how instructors had trained them to think. At that point, students do a usability test mostly to find minor issues and confirm their design decisions. Usability is treated too much as an easy "add-on" solution to the internal systems of other subject matter areas. These systems often remain in their old ways despite usability's presence. By contrast, I see an enormous difference in students' perception of both usability and the design process of any product, when I require activities such as brainstorming with users, conducting a survey, paper prototyping, or iterative testing. In other words, usability-related concepts should be structurally built into a design project itself.
- Much conversation about usability revolves around usability processes, tools, and cutting-edge technologies. From my observation, often students' main deficiency comes from their writing skills and interpersonal communication strategies. Ultimately, usability is about people. Be it questionnaires or interviews, usability requires sophisticated communication and listening skills, and the ability to work flexibly with various kinds of people.

Our very focus on "usability testing," rather than user experience design, reflects the problem that usability is celebrated but not infused in our curricula. At a deeper level,

- It reflects our assumption that technical communicators "communicate" already-designed products but aren't central to the design process itself.
- It distances technical communicators from engineers, designers, and other stakeholders, all the while such boundaries are blurred in the workplace.
- It indicates our tendency to guard academic disciplinary boundaries and lack of responsiveness to industry trends.

I argue that we ought to infuse user experience into technical communication curricula. User experience re-orients the design process by incorporating user feedback through a wide range of methods including but are not limited to usability testing. It is vital to understand how to do it and how to do it in an organizational setting. The truth is that if we want students to intuitively consider user experience, we must explicitly and structurally embed it in the native context of design itself.

In the following part of the paper, I make suggestions to infusing user experience into a technical communication curriculum. I provide in-depth advice to structuring a course in user experience design. I propose a three-course structure in adequately addressing user experience. Finally, I discuss what to do if a program allows for only one course in usability due to budget or administrative difficulties.

TECHNICAL COMMUNICATION CURRICULA

Usability must "come out of the closet" in technical communication curricula. Containing usability in "that usability course" by the "usability person" is unfit in today's technical communication workplace. User experience should be a core competence area of a technical communication curriculum. It is not only a subject matter area, but a general mindset that can benefit all kinds of communicators and engineers. Specifically, this infusion means the following:

- Don't hold back usability. Introduce it when students take the first course in the program. The most effective way to learn usability is to do it. There must be "early intervention" to enable students to form good habits and gain a user-centered mindset.
- Require a course or courses in user experience for all technical communication students. Ideally, there should be a course that frames user experience broadly, a course specifically on usability testing, and another course that probes in-depth user research methods. I discuss this three-course structure later in this paper.
- Build user experience into product-creation courses. These courses include but are not limited to document design, information design, web design/writing, content strategy, content management, digital media production. Without losing the focus of these courses, students can be required to conduct small-scale usability studies along their design process. The key is not necessarily to conduct a full-blown usability study — and time may not allow that — but rather to help students get used to the flow of user-centered design.
- Use an engineering problem-solving approach in technical communication courses. Much of a technical communicator's work nowadays already resembles that of an engineer. As the high-tech industry evolves, the artificial boundaries between a communicator and an engineer is likely going to be blurrier. We should teach technical communication as a process of constructing practical solutions using innovative thinking, creativity, solid skills and a broad contextual awareness.
- User experience has its place in programmatic affairs. It should be an aspect of program objectives and assessment. It should have representation on a program's industry advisory board.
- Make it multidisciplinary. User experience absorbs theories and concepts from human factors, cognitive psychology, engineering, and marketing. Informing students of these concepts helps them understand why, what, and how.
- Enhance students' writing and interpersonal communication skills. Tools and technologies do not substitute for some of the most fundamental competencies, including empathy toward users, open-mindedness, patience, listening, etc.
- Make it workplace driven. Technical communication graduates must have the big-picture of how user experience design fits in the broader flow in their

workplace. They ought to know how business strategy and objectives, organizational politics, and stakeholder relationships influence and are influenced by user experience.

- Require a data analysis or statistics course. Thinking about user experience through the lens of data enables students to design effective, precise, and measurable studies.

A Course in User Experience Design

A technical communication program should have a course that takes students through the typical flow of user experience design. Instead of testing a finished product, start with a low fidelity prototype or a brand new design idea. Students then design with user participation and witness the entire process as the product evolves.

The following is an example that outlines the flow of such a course:

- Module 1: Preliminary user inquiry

  In this module, students learn some basic methods of conducting initial user research. This may involve observing how users interact with an existing (or a competitor's) product, surveying or interviewing users about their interests, collecting early feedback on students' design ideas. This is a crucial "discovery" phase that informs students the interests and needs of their target users. It enables students to then create effective personas and stories.

- Module 2: Personas and stories

  With the findings from initial user research, students create personas and stories that represent these users' goals and interests.

- Module 3: Paper prototyping and user feedback

  Students create low-fidelity sketches that reflect their design ideas. These sketches can be done in collaboration with target user participants. This is an agile process of quick feedback through paper prototyping and rapid prototyping. Many methods can be taught and practiced in this module, including card sorting, cognitive walkthrough, heuristics, etc.

- Module 4: High-fidelity prototyping and usability testing

  Building upon accumulated design ideas and user feedback, students create a high-fidelity prototype. This is a phase where a usability test can be conducted with a series of scenarios and tasks to observe how participants interact with the prototype. Eye tracking, critical incident analysis, focus groups, and other methods can be used as well.

- Module 5: Data analysis, final report

  Students analyze and present data, and make recommendations for the design team. Students may also be required to propose future user experience research plans to demonstrate their understanding of this on-going process.

These five modules enable students to discover user requirements, distill user characteristics, and design prototypes at varying levels of granularity. This is the formative design process infused with user experience.

A Three-Course Structure

A semester's time is quite limited. I propose a three-course structure to address user experience satisfactorily. These three courses are: user experience design, usability testing, and user research methods. At the Metropolitan State University in St. Paul, MN, where I teach, we are creating this three-course structure.

The user experience design course, as I have explained earlier, addresses primarily the iterative and agile flow of designing user experience. In the second course, usability testing, students learn to plan for a usability test, create protocols such as questionnaires, tasks, and scenarios, and analyze usability findings. The third course, user research methods, provides a deeper examination of various methods in user experience research. These methods are somewhat addressed in the other two courses I mentioned, but they deserve a dedicated place and a substantial amount of time to study and practice. Students learn a method's history, its practice in various disciplines, and its contemporary use in technical communication. They practice using several methods, observe the similarities and differences among these methods, witness the strengths and weaknesses of each method, differentiate the data generated from one method to another, and gain insights in choosing effective methods in different situations. I believe that this three-course structure reaches a solid breadth and depth in usability-related concepts for technical communication students.

Last but not least, many programs face budgetary difficulties or administrative obstacles. When the three-course structure isn't realistic and we are given only one course in usability, we must make smart choices to ensure that student learning isn't sacrificed.

- Frame the course as user experience, which provides the "umbrella" context for all topics related to usability.
- Give a broad picture of how user experience relates to other disciplines, business strategy, and innovation.
- Build "design" into the course. Allow students to experience a cycle of design-feedback-design-feedback. Completing a usability test isn't the end. Require students to use the usability findings to design. From my observation, this design activity doesn't need to be full-blown. In fact, creating wireframes and paper prototypes "refreshes" the classroom and the learning experience.

TOWARD A COMPREHENSIVE CURRICULUM IN USER EXPERIENCE

Usability-related knowledge and skills should no longer be an isolated subject matter area served by one course and one faculty member. Technical communication programs must conceptually broaden usability into user experience, achieve a breadth and depth in user experience, train students to see user experience as an iterative, agile, participatory, and formative process, and cultivate innovative design thinking and problem-solving.

As a discipline, technical communication is primarily grounded in the traditions of rhetoric, language, and communication. Our disciplinary origin, however, should not restrict us from teaching and practicing what it takes to improve effectiveness of communication. Technical communication-turned-usability curricula have their limits. We must move beyond a "usability person," "that usability course," or an end-of-semester rush on usability.

A Comparative Approach to Enhance Information Interaction Design of Visual Analytics Systems

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ABSTRACT

This paper introduces a novel comparative strategy to access, synthesize, and redesign a mobile visual analytics (VA) system. Designing, evaluating, and improving VA tools are challenging because of the exploratory and unpredicted nature of their users' analysis activities in a real context. Often the system development approach is running rounds of iteration based on one or a few design ideas and related references. Inspired by ideation and design selection from design-thinking literature, we start to redesign systems from comparison and filtering based on a broad range of design ideas. This approach focuses on the information interaction design of systems; integrates design principles from information design, sensorial design, and interaction design as guidelines; compares VA systems at the component level; and seeks unique and adaptive design solutions. The Visual Analytics Benchmark Repository provides a rich collection of the Visual Analytics Science and Technology (VAST) challenges submission reports and videos. For each challenge design problem, there are multiple creative and mature design solutions. Based on this resource, we conducted a series of empirical user studies to understand the user experience by comparing different design solutions, enhanced one visual analytics system design MobileAnalymator by synthesizing new features and removing redundant functions, and accessed the redesign outcomes with the same comparative approach.

Categories and Subject Descriptors

H.0 Information Systems: General

General Terms

Design, Human Factors

Keywords

Information interaction design, visual analytics, exploratory design thinking, comparative analysis, and mobile user experience

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INTRODUCTION

Visual analytics (VA) is the science of analytical reasoning facilitated by visual interactive interfaces (Thomas & Cook, 2005). In contrast to machine learning or statistics, VA couples human and computer closely together. There has been a significant rise in the number of VA systems built to assist analysing the multi-dimensional complex information during the recent decade. After a VA system has been developed, how should it be evaluated and improved? Assessing a VA system's effectiveness is challenging because VA tools combine several disparate components, such as analytical reasoning, visual representations, interaction design, data transformations, and collaborative tool development. These components belong to different domains and require different guidelines to access. Plaisant et al. (2009) argue that traditional evaluation metrics, such as task completion time, number of errors, or recall and precision, are insufficient to quantify VA tools because of the exploratory nature applied by analysts when using the VA tools. During the past decade, different evaluation methods have been proposed to understand the complex behaviour (Lam, Bertini, Isenberg, Plaisant, & Carpendale, 2012), but not much has been reported on improving the system through empirical studies.

Most VA systems are so complex that designers and developers have difficulties exploring different approaches. Failing into the problem of "getting the design right" (Greenberg & Buxton, 2008) is easy: this problem arises when the designers stay with one design from the beginning and try to improve that single solution, failing to compare other potentially better solutions. VAST challenges provide benchmark data sets to stimulate visual analytics research and evaluations on VA systems (Plaisant, Fekete, & Grinstein, 2008). The repository not only contains data sets and tasks of different VA contests and challenges, but also collects materials describing uses of the benchmarks, such as experiment materials, analysis results, and contest entries. Participants of this competition usually pay full attention to the part of creative problem solving and skip the consideration of whether the interaction and work flow is suitable for users. Seeing different design solutions to solve the same problem in those submissions is exciting, but no effort is devoted to synthesize these efforts and build a more user effective VA system to solve similar analytics problems.

In this paper we introduce a four-step approach of filtering, comparing, amplifying, and re-evaluating information interaction design in a VA system by using other VA systems that solve the same or similar analysis tasks. We applied this approach to our competition entry MobileAnalymator (Figure 1) in VAST 2011 mini-challenge (Grinstein et al. 2011), in which our system won the award of *Novel Extension of Visual Analytics to Mobile Devices* (Chen, Qian, & Zhang, 2011).

EXPLORATORY DESIGN THINKING MODEL VS. ITERATIVE ENGINEERING DESIGN MODEL

How might we effectively enhance the information interaction design in VA systems and create more supportive tools? Tim Brown (2008) states that "thinking like a designer can transform the way you develop products, services, processes – and even strategy." The ACM curriculum (Hewett et al., 2013) suggests that design is an equal partner with evaluation in the development of interactive computing systems. Evaluation has been emphasized a lot in many application-related literature, sometimes even to a harmful level, especially if the evaluation is done at a premature early design stage (Greenberg & Buxton, 2008). In contrast, some perspectives of design, especially ideation and design selection, have not been reflected as much in VA application literature. The design process is rational while targeting to solve ill-defined problems.

The problems a VA system faces are also ill-defined. Solving such a problem requires a synergy between computer powers and human capabilities to analyse, reason, and deliberate. We conceive that some well-established design process from other design domains may benefit the development of VA systems.

The design process in system engineering is mostly modelled as several iterative cycles composed by problem identification, ideation, design selection/combination, refinement, analysis, then followed by plan and implementation. Such a method has also been thoroughly discussed in HCI domain (Buxton, 2010). While designing VA systems, we often had no stage of sufficient idea exploration because of a lack of resources. We started with some ideas or some existing platforms and followed the "design, implement, evaluate" cycle to get the design right. This quickly led to local hill climbing, and missed searching for the global optimal solution.

Here are two potential reasons for such a condition. First, a simple early design (a sketch or an interactive system wireframe) is neither sufficient to demonstrate the idea nor effective to reflect the multidimensional nature of data and the complexity of VA problems. To test the idea, the developer must implement it and use real data. Because of the limitation of resources (e.g., manpower or time), testing many ideas is impossible. Second, computer engineers are used to solving well-defined problems and usually do not start a project by exploring a vast number of alternatives. Without a broad ideation exploration, the system development may fail into the problem mentioned earlier of "getting the design right."

THE STUDY

For the VAST challenge entries, because of the limited time (March to July every year) and manpower (usually a team with several students and faculties), for a team to create a global optimistic solution is almost impossible, even if the entry has won an award. But many of them have nevertheless reached the summits of "local hill climbing" and demonstrated some very useful and unique features to attack the problem. These solutions have been archived for public access. It is a big waste when participating teams focus only on their own systems without carefully learning from others. These 20–30 well-implemented ideas can be seen as an ideal ideation pool for us to select and synthesize, which may lead to a global optimistic solution. Literature reviews, to some extent, can be seen as an approach to idea exploration, by which we try to find inspirations from other work by others. However, inspiration of this kind is indirect. Finding other projects working on similar problems is difficult. In contrast, these challenge entries are all targeting at solving the same problem, and their experiences and solutions will directly inspire our own system design and improvement.

Our system enhancement approach contains four stages: (1) the preliminary study to select and filter challenge entries; (2) the comparative study across different VA systems; (3) applying findings and redesigning the system; and (4) another comparative study to access the redesign outcome. We worked on the VAST 2011 mini-challenge of "Geospatial and Microblogging - Characterization of an Epidemic Spread" (Grinstein et al. 2011). As a spatial temporal problem, this challenge's data contain one million microblog messages with time stamps and location data. Some of the messages contain disease-related words, such as flu, fever, headache, vomiting, and diarrhea. The challenge requested participating teams to create visual analytics solutions to identify where the disease outbreak started on the map and to explain how they arrived at the conclusion.

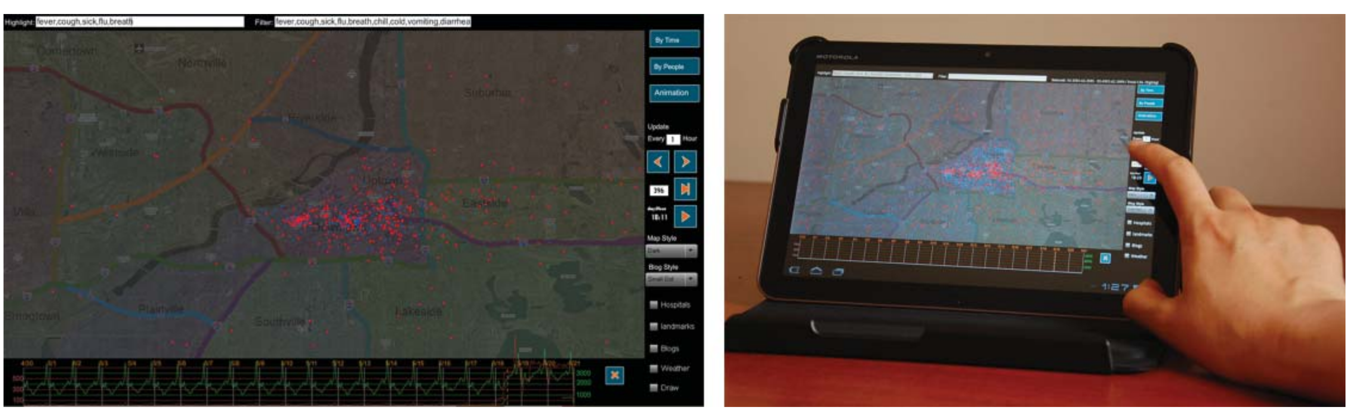

Figure 1. Original Interface of MobileAnalymator: 2011 VAST Award-winning entry.

The Stage of Filtering

We started by examining all 30 submissions of 2011 mini-challenge 1. We adopted design principles from the following areas to filter systems.

- Information Design. Good information design should reveal rich detail and is meant to be read closely. Edward Tufte argues that principles of information design are "universal – like mathematics, and are not tied to unique features of a particular language or culture" (Tufte, 1990).
- Interaction Design. There are several groups of widely recognized interaction design principles, such as Jakob Nielsen's ten usability heuristics for user interface design (Nielsen & Molich, 1990), David Benyon's twelve principles for designing interactive systems (Benyon, 2010), Paul Trenchard-Seys's eleven principles of interaction design (Trenchard-Seys, 2010), and Ben Shneiderman's "eight golden rules" of interface design (Shneiderman, 1986). By comparing these groups, we conclude design principles that are generally agreed on by different groups, and most are related with our VA context.
- Sensorial Design. The research on sensorial design focuses on user senses to amplify design decisions (Chand & Ishii, 2006).

Among the 30 submissions, we applied these principles to examine them one by one and selected 8 systems to conduct the comparative study. These 8 all have some unique features that other systems do not. Although some won no award, we want to include them to study the feature and see if we can adopt them to our final design.

While analysing all these 30 systems, we found that there exist some common information design issues, such as the map visualization, which includes too much redundant information; colours are wildly used in some systems; and the affordance of system functions was poor. Furthermore, we also found that we can divide the VA system design into four components in general: geospatial visualization, temporal and weather visualization, microblog text visualization, and other supportive analysis panels. Based on this finding, we grouped the visualizations from the selected 8 systems into four groups and designed the comparative questionnaire. Laskowski et al. suggested that evaluations should be conducted at three levels: component, system, and work environment (Thomas & Cook, 2005). We chose to run our comparative study at the component level and to inspect VA system features in those four different groups because our end design will include many of these features.

The Stage of Comparing

After examining all submitted systems, we generally sliced the VA system design into four component groups: geospatial visualization, temporal and weather visualizations, microblog text visualization, and other supportive analysis panels. We grouped the selected 8 systems into these four groups and conducted a comparative user evaluation with 20 subjects having university-level education. Although the subjects were unable to test all systems directly, we provided screenshots, videos, and side explanations to help them understand the functionalities.

Jakob Nielsen (2012) suggests that in a usability study, testing 20 users can get statistically significant numbers, although getting more users can tighten confidence intervals further. In the first round of user study, the 20 subjects were recruited from the campus with an even distribution of genders (10 males, 10 females) and a big variety of subject backgrounds. We randomly named the eight selected entries as systems A, B, C, D, E, F, G, and H. In the evaluation, five big categories are in the questionnaire: overall system interface and navigation, geospatial visualization, temporal and weather visualizations, and miscellaneous, and each category has several questions, twenty in all. The studies were conducted

Figure 2. One subject answers questions of the comparing study.

In each component, the researcher will show a set of printed screenshots or open-related movie clips. Subjects were asked to answer such questions as "Can you describe the current distribution of bloggers on the map?" Or, "What do you think is the function of this menu bar?" Their verbal answers were audio- recorded. We visualized the results from questionnaires as in chart graphs in Excel. Figure 3 shows one result—subject ratings of statement 2.1: "You can recognize the distribution of bloggers on the map." If the subject strongly agrees, the response should be 5. If the recognition is unclear, 2, or "disagree," may be the answer.

In the chart of Figure 3, systems A, D, and G clearly have the highest scores, and systems B and F are comparably less successful in terms of blog distribution visualization. We also can observe some characteristics from our subjects. For example, subject 6 is a very "generous" judge and had given nearly all systems scores of 4 or 5. Subjects 4, 7, 9, and 12 have strong preferences and gave comparably distinctive scores to different systems.

The pool of twenty subjects helped to provide statistically significant results. We used the same method to review all question charts. For each of the five components, we gathered some very valuable insights. For example, subjects prefer to have bigger and cleaner map visualization in the system with supplements of other visualizations. Among the four systems providing key-word search, subjects really like the visualization that shows the trends of key-word developments.

We transcribed the audio recordings into text. As an approach of investigator triangulation, two researchers analyzed the qualitative data to ensure validity. Some good aspects and problems for each system were even more clearly stressed in the discussions. For example, in system C, the time controlling bar is on the bottom, but the date and time display are on the top of the interface. It took more time for users to link these two together. Although we did not any question related to visibility of status in temporal visualization, two subjects still initiatively complained when they were inspecting the temporal visualizations in some systems.

We collected and analysed both the quantitative data (rankings in a Likert scale) and qualitative data

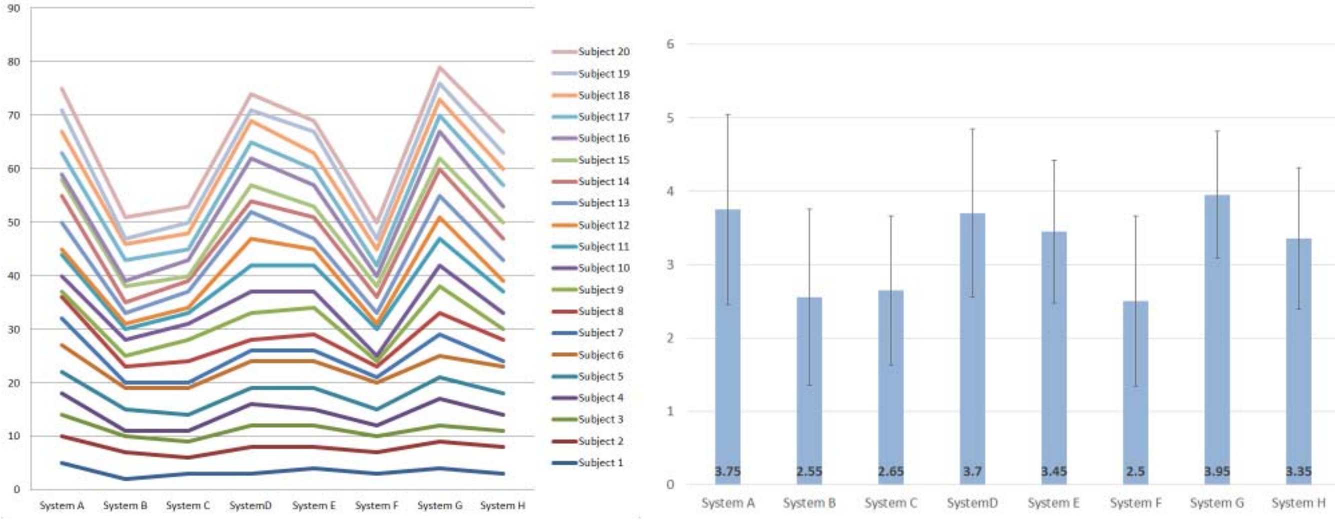

Figure 3. Chart of question 2.1: "You can recognize the distribution of bloggers on the map." Right: the chart of means and standard deviation for the same data.

(personal interviews after the comparative study). In our study report, user preferences are clear and solid.

The Stage of Redesigning

Based on insights provided by the studies, we redesigned the system and implemented a quick prototype for evaluation. The redesign process started from team-based brainstorming sessions and sketches. We not only sketched the possible overall layout arrangements to incorporate more-appreciated visualization features, but also proposed new visualizations inspired by the evaluation results.

Figure 4 shows the screenshot of final system redesign. A later evaluation shows that the interface looks clean and intuitive. A light-blue to grey tone has been used. It is composed with three main sections: map, time/weather, and controls. The blog list is integrated in the temporal panel with the key words highlighted. It integrated many good features from different systems. For instance, the MobileAnalymator (Chen, Qian, & Zhang, 2011) three modes, time, people, animation, are directly borrowed to allow a user to see the data in different formats. By people and animation modes, the analyst may trace blogger movements, which is unique among systems.

Figure 4. Redesigned Interface of MobileAnalymator

Some good features from other systems include overall time and time range, which could be easily altered by dragging the two end sides of the sliding bar. We embed a text-cloud visualization above the key-word searching panel to provide users a quick glance of frequency of key words and to allow user interaction with tag clouds. Considering the evaluators' advice about the haptic interaction of blog selection with figures on the tablet computer, we provided the choice of using either small, middle, large, rectangle, or polygon range to select blogs in a certain area on the map.

The new design is then developed into a wireframe prototype using the wireframe prototyping tool Axure RP. To make sure the design fit for the real data, we used one working system to select blogs and generate visualizations from the real data. The generated blogs and visualizations are then twisted to meet the new design standard (e.g., change color of dots). For example, the tag clouds are generated using Wordle (Feinberg, 2009) by using all real blog texts at the given screen. Blog locations and color highlights are also accurately from a real working system. Thus, although the prototype is unable to provide real time interaction, it is sufficient to communicate the visualization and interaction design and to let the user see the real results.

The Stage of Reevaluating

We conducted another round of study to evaluate our new design. Focusing on accessing the effectiveness of information interaction design, we decided to use the same comparative approach. Systems A, D, G, and H and the original design E were chosen to be compared with the new design (the other three systems had obvious lower scores). To make a fair comparison, we created a similar set of materials (screenshots and video) for the new design as the old systems. The video was carefully designed to have the same length and same function as others. The screenshots of systems were mixed together and handed over to the subjects without a clear sequence. From the original questionnaire sheet, we selected only the first eight questions for subjects to answer, since these questions are about the overall system interaction design. Twenty new subjects with the same diversity standards were recruited to ensure the validity of this study.

After collecting the data, we first compared the evaluation results of A, D, E, G, and H with the first evaluation results. The overall scorings were quite close, which also confirms the validity of the previous study. The graph of Figure 5 visualizes their scores in comparison with the new design's score. The maximum total score is 800 (20 subjects on 8 questions, 5 points each question). Overall, the receptions of the new system were very positive.

The interface was designed by a student majoring in interaction design. Because of her design training, the new interface earned good scores on questions related to the overall look and feel, including color usage and graphics layout (Question 1.x). In the new design, we provided no new types of visualization. Although we did some color fine-tuning on visualization, the evaluation shows that the improvement is limited.

Based on the user evaluation outcomes, we improved the design of MobileAnalymator by (1) creating a color scheme for the system and all visualizations; (2) integrating new features into the platform; and (3) adjusting the interaction and work flow among different visualizations. We recruited a different group of users and conducted a round of heuristic evaluations with the same information interaction design principles after the redesign. The scores of MobileAnalymator's show a significantly improved performance.

DISCUSSIONS

While integrating new features from other applications, one risk we were concerned about most was the "Frankenstein design," which means directly combining other features together without considering their context. In such a system, components are isolated, and buttons and icons in the interface are scattered around the desktop. The user experience is almost guaranteed to be terrible. We must gain deep understandings on these features, digest, and then carefully integrate them in an "organic" way.

While incorporating an external feature to a system, we propose that the designer should adapt the feature at three levels:

- Graphical design level. Graphic elements, such as colors, text fonts, and layouts of this function/feature must fit into the system's overall style. This is the easiest part of the integration. But dealing with visualization details may not be easy. In our 2011 redesign, we first set up a color schema; defined the style of fonts, tabs, and buttons; sketched several possible layouts; and recreated new graphics to fit the system.

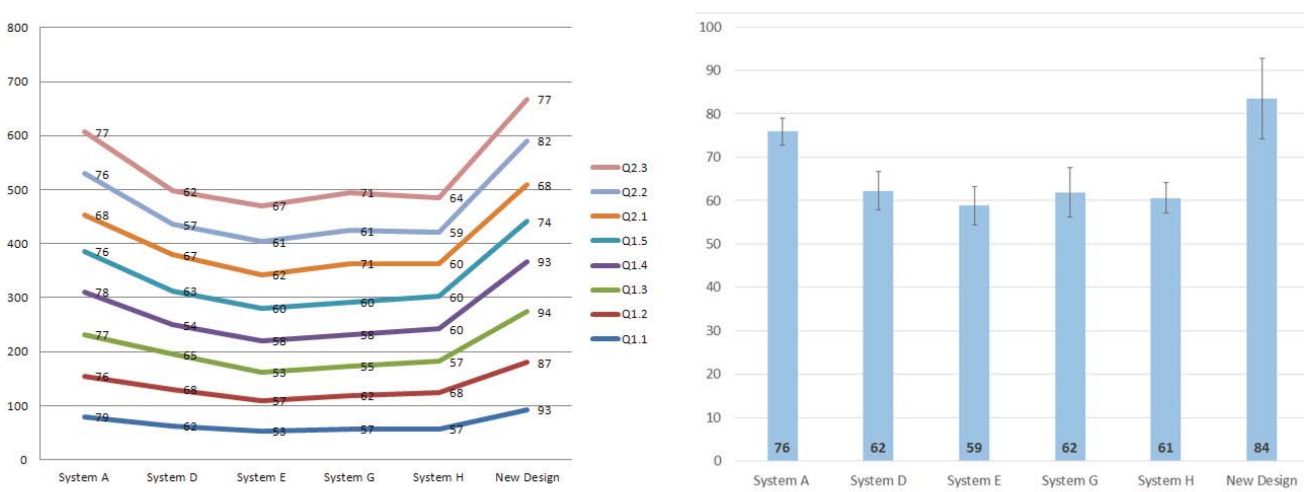

Figure 5. Charts of Reevaluation Assessment (Right: the chart of means and Standard Deviation)

- Information interaction design level. To promote the analysis provenance, we should integrate the integrated feature into the analysis process without navigational interruptions. While working in a VA system, the user usually follow a process, drills deeper within one visualization or links across different visualizations. In the process, there will be upstream visualizations leading to the current visualization and downstream visualizations that can be led to from the current visualizations.
- Analytical sense-making level. This is critical to support the visual analysis process. To embed a new feature into an existing system, we must interpret how the user perceives the new feature or how the existing visualizations are affected by it, and then sort out how to transfer data between visualizations. The new feature might fill in some gaps or create a new perspective on top of the original system. This change may greatly improve user's interpretation upon the overall navigation.

These three levels are not isolated from one another. Most often, we must consider all of them while adopting a new feature. We may start with adjusting the appearance of the feature, redesign its interactions with other visualizations, and then twist its context and data to fit it into the new analysis process.

CONCLUSION

In this research, we borrow an exploratory design model from the design society, fit it into the context of visual analytics system design, make use of existing contests and challenges design entries, and test the model's effectiveness by applying the design approach upon evaluating and redesigning systems for VAST mini-challenges. This four-step approach focuses on the information interaction design of systems; integrates design principles from information design, sensorial design, and interaction design as guidelines; compares VA systems at the component level; and seeks unique and adaptive design solutions. The user evaluation approves that the redesign led by this comparative approach is successful.

Currently our new comparative approach is limited in the VAST contests and challenges because it requires multiple creative and mature design solutions to access and filter. However, we are more excited in the new perspective it brought in. VA system design is an exploratory and never-ending practice. From this practice, the improvement the VA system made is certainly important. The knowledge the researcher has received through review, integration, and re-access of others' design solutions are even more valuable.

REFERENCES

Benyon, D. (2010). Designing Interactive Systems: A Comprehensive Guide to HCI and Interaction Design (2nd ed.). Pearson Education Canada.

Brown, T. (2008). Design thinking. Harvard Business Review, 86(6), 84.

Buxton, B. (2010). Sketching User Experiences: Getting the Design Right and the Right Design. Morgan Kaufmann.

Chang, A., & Ishii, H. (2006). Sensorial Interfaces. In Proceedings of the 6th conference on Designing Interactive systems (pp. 50–59). Retrieved from http://dl.acm.org/citation.cfm?id=1142415.

Chen, Y. V., Qian, Z. C., & Zhang, L. (2011). MobileAnalymator: Animating Data Changes on Mobile Devices: VAST 2011 Mini Challenge 1 Award: Novel Extension of Visual Analytics to Mobile Devices. In 2011 IEEE Conference on Visual Analytics Science and Technology (VAST) (pp. 313–314). doi:10.1109/VAST.2011.6102490

Feinberg, J. (2009). Wordle. Ch, 3, 37–58.

Greenberg, S., & Buxton, B. (2008). Usability Evaluation Considered Harmful (Some of the Time). In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 111–120). Retrieved from http://dl.acm.org/citation.cfm?id=1357074

Grinstein, G., Cook, K. A., Havig, P., Liggett, K., Nebesh, B., Whiting, M., & Konecni, S. (2011). VAST 2011 Challenge: Cyber Security and Epidemic (pp. 299–301). Presented at the IEEE Symposium on Visual Analytics Science and Technology, Providence, RI.

Hewett, T., Baecker, R., Card, S., Carey, T., Gasen, J., Mantei, M., Perlman, G., Strong, G., & Verplank, W., (1996). ACM SIGCHI Curricula for Human-Computer Interaction. Retrieved 29 March 2013, from http://old.sigchi.org/cdg/

Lam, H., Bertini, E., Isenberg, P., Plaisant, C., & Carpendale, S. (2012). Empirical Studies in Information Visualization: Seven Scenarios. IEEE Transactions on Visualization and Computer Graphics, 18(9), 1520–1536. doi:10.1109/TVCG.2011.279

Nielsen, J., & Molich, R. (1990). Heuristic Evaluation of User Interfaces. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 249–256). New York, NY, USA: ACM. doi:10.1145/97243.97281

Nielsen, J. (2012). How Many Test Users in a Usability Study? Retrieved 31 March 2013, from http://www.nngroup.com/articles/how-many-test-users/

Plaisant, C., Fekete, J. D., & Grinstein, G. (2008). Promoting Insight-based Evaluation of Visualizations: From Contest to Benchmark Repository. IEEE Transactions on Visualization and Computer Graphics, 14(1), 120–134.

Plaisant, C., Grinstein, G., & Scholtz, J. (2009). Visual-Analytics Evaluation. IEEE Computer Graphics and Applications, 29(3), 16–17. doi:10.1109/MCG.2009.56

Shneiderman, B. (1986). Designing the User Interface: Strategies for Effective Human-Computer Interaction. Boston, MA: Addison Wesley.

Thomas, J. J., & Cook, K. A. (2005). Illuminating the Path: The Research and Development Agenda for Visual Analytics. Los Alamitos, CA; Pacific Northwest National Laboratory (PNNL), Richland, WA (US): IEEE Computer Society.

Trenchard-Seys, P. (2010). 11 Principles of Interaction Design explained. Short Bored Surfer. Retrieved 29 March 2013, from http://shortboredsurfer.com/2010/08/11-principles-of-interaction-design-explained/

Tufte, E. R. (1990). Envisioning Information. Graphics Press Cheshire, CT.

Letting Context Speak: The use of co-creative, design-led, and user-centered design methods in the design of complex public communications

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ABSTRACT

This paper discusses how co-creative, design-led, and user-centered design methods are being utilized to gain insight into the factors that influence the communication of food recalls. It looks at the role of designer and public in these methods and considers the value of these methods for other settings.

Categories and Subject Descriptors

H.0 Information Systems: General

General Terms

Design, Human Factors

Keywords

Food recalls, human-centered, user-centered, communication design, complex information, public communication, exploratory research.

> Design is a problem-oriented, interdisciplinary activity. There is a need to identify important problems and develop interdisciplinary strategies to deal with them. It is not sustainable to continue just reacting to clients' requests for design interventions. It is necessary to consider the discovery and definition of physical and cultural problems as an essential part of design. The nature of each problem might suggest the spectrum of disciplines required to confront it. A set of tools to look at the world will have to be developed by inquisitive, critical, interdisciplinary observation, performed by people in love with humanity.
>
> Jorge Frascara (2002)

In 1972, Victor Papanek published his provocative book *Design for the Real World*. In it, he called for designers to become advocates for society. To work for the good of mankind, not just respond to the frivolous desires of consumerism. In the last four decades, others have repeated Papanek's call for change to the way design engages culture. Victor and Sylvia Margolin have challenged designers to show how our field can contribute to human welfare (2002). And, as noted above, Jorge Frascara encourages designers to look beyond client-initiated projects. He suggests that it is our responsibility as designers to uncover communication problems that impact society.

Unfortunately, problematic communications abound in our society. The 2000 U.S. Presidential ballot recount in Florida is a memorable example of poor design. This example gained enough press to put design on the national news. In addition, AIGA (the largest professional design organization in the US) responded to the election by initiating an ongoing ballot and election design project. This project has produced a series of field guides that provide best practices for election officials. The AIGA has also worked with the U.S. Election Assistance Commission and several states to develop national guidelines for ballot and polling place design (2014).

The recent controversy over the healthcare.gov website has also gained national attention to design issues such as usability and user experience. In a 2013 article in wired, Marcus Wohlsen summarizes the concern:

> Usability is perhaps the core value of good web design. And more than 15 years after the popularization of the web, it's not like we don't know what good user experience looks like. It's an entire job category. While complaints about Healthcare.gov have centered more on backend enterprise issues than front-end design issues, the distinction doesn't matter to users. It works or it doesn't. And if it doesn't, users shouldn't be subjected to what has amounted to a huge waste of their time.

In both of these cases, the response has been a reaction to public outcry. But for every election or healthcare website debacle there are dozens of everyday experiences that cost the public time, money, and health. How do we identify and respond to the quieter calls for improved public communication? And can we initiate this type of work before the public, industry, or government fund it? How do we do it in a way that involves the public, utilizes communication expertise, and persuades organizations, industries, or the government to support research?

FINDING A STARTING POINT: FOOD RECALL COMMUNICATIONS

Like election ballots and the healthcare.gov website, food recalls

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have a large impact on our culture and face complex communication challenges. It is estimated that foodborne illnesses cost the US $152 billion annually (Scharff, 2010). According to the Centers for Disease Control and Prevention (CDC), 1 in 6 (48 million) Americans are affected with foodborne illness annually. Of those affected, 128,000 are hospitalized and 3,000 die.

The U.S. Department of Agriculture (USDA) and the U.S. Food and Drug Administration (FDA) oversee U.S. Food recalls. The two agencies primarily use press releases to the media, online postings, and email alerts to notify the public about food recalls (GAO, 2004); however, the public remains largely uninformed. The average American is aware of 2 to 5 recalls a year (Peake et al, 2013). In contrast, the fourth quarter of 2012 averaged six recalls per day (Gelski, 2013).

Calls for Change

Calls for change to the way food recalls are communicated have come from within the U.S. Government. In 2004, the U.S. Government Accountability Office (GAO) suggested that efforts to communicate food recalls to consumers were ineffective. Their report to congress led to the 2011 FDA Food Safety Modernization Act (FSMA). The FSMA has given greater authority to the FDA and is reforming how food is tracked, but it has done little to change the way food recalls are communicated to the public.

Several studies from public organizations have also called for change in the way food recalls are communicated. The Department of Health Policy and Management at Harvard (Steelfisher, et al., 2010) and the Food Policy Institute at Rutgers University (Hallman et al., 2009) called for new ways of communicating food recalls. Additionally, the Center for Science in the Public Interest and the Consumer Federation of America and others have suggested that food recall communications should be placed in retail stores (GAO, 2004; Waller & Searns, 2006).

The Need for Public Participation

The majority of existing studies or reports are based on the results of surveys or interviews. These methods give us a general understanding of what the public thinks but according to participatory or co-creative design researchers, they fail to reveal more latent beliefs that are critical when designing future products (Sanders, 1999). Visser, Sanders, Stappers, and Van Der Lugt suggest, “For learning about potential future experiences, we need to include peoples’ dreams and fears, their aspirations and ideas” (2005). In her earlier work, Sanders states, “The biggest opportunity for improving the quality of products that we design today is to practice collective creativity with ‘users’” (2001).

This need for greater public participation in the design process is illustrated by two surveys that seem to contradict each other. The first is a 2009 survey done by the Food Policy Institute at Rutgers University. Their research suggests the public would prefer to receive recall information, while they, “are thinking about food” (Hallman et al., 2009). Specifically, it suggests that 73% of the public prefer to receive recall information on their shopping receipt. However, a second survey conducted by researchers at the University of North Texas and Louisiana State University concluded that the public would prefer recall information in stores near where a recalled product was sold (69%). In this survey only 3% of the respondents selected the receipt as the preferred location for food recall notification (Carlson and Peake, 2013). By adding more options to the question, the second survey saw a dramatic change in response.

This apparent contradiction is a good example of the limitations of more traditional or qualitative inquiries into public preference. There are times when these approaches are rich and valuable; however, when imagining future products they fail to gain the deep insight that more participatory or co-creative methods might obtain (Sanders, 1999).

Contextual Factors for Food Recalls

Food recalls face complex logistic, technology, and human factors. Logistically, food recalls rely on retailer data records that are not standardized. The Rapid Recall Exchange (RRE) is a program of the GS1 US designed to streamline communications between suppliers and retailers. The program has over 1,000 members and represents over 85% of US grocery All Commodity Volume or annual sales volume (GS1, 2012). The RRE is a step toward more accurate recall information, and it is helping organizations meet requirements of the FDA Food Modernization Act, but it does not set a national standard for supply chain data across the industry. This may be why researchers such as Hallman and Cuite suggest that partnering with retailers may be the first step in changing food recalls (2009).

Technologically, food recalls face a changing scene. The growth of smart phone and tablet usage in the US has changed the way media is consumed. Facebook, Twitter, and other social networks did not exist fifteen years ago. Research has shown that social networks may be a valuable way to communicate food recalls, although consumer trust of social networks to communicate food recall information is currently quite low (Carlson & Peake, 2013). These factors are both a challenge and an opportunity for rethinking how food recalls might be communicated in the future and need to be integrated into research methods.

A diverse and changing culture is also a factor in communicating food recalls. The 2010 Census revealed that the number of people in the US that speak a language other than English at home has nearly tripled in the last thirty years (Barron, 2013; Ryan, 2013). Generationally there are also divides in use of technology. In January of 2014, Pew Research showed that 79% of 18-29 year olds owned a smart phone, while 45% of 50-64 year olds and 18% of adults 65 and up owned a smart phone. However, access to smart phone technology does not necessarily equate to being better informed about food recalls, as millennials (born between 1977 and 2002) are less aware of recalls than older generations (Peake et al., 2013). Previous research has also shown that the public is concerned about food safety, but few will take steps toward being better informed (Cuite et al., 2007). This public paralysis is evident in research from the Food Policy Institute which suggests that 40% of the public would be interested in receiving emailed food recall alerts but only 6% of the population actually utilize the existing service (Hallman, Cuite, & Hooker, 2009).

An Opportunity For Research

The complexity of food recall communications make it well suited to enact the kind of research encouraged by Frascara, Papanek, and Victor and Sylvia Margolin. It demands a multidisciplinary team with a human-centered approach that can communicate outcomes clearly to potential public or private partners. It is an opportunity to work for the good of mankind and not just respond to the frivolous desires of consumerism.

DEVELOPING A PLAN: HUMAN-CENTERED DESIGN APPROACHES

Human-centered design is a broad term used here as a way of describing a variety of design methods that aim to incorporate end-users into the research process. Most human-centered design methods seek to reveal deeper understanding of end users.

Exploring the Terrain

Over the last decade, Elizabeth Sanders has been evolving a map of human-centered design methods with a variety of collaborators including, Peter Kwok Chan, Pieter Jan Stappers, and André Liem. Sanders' 2006 map established x-axis and y-axis labeling that has changed little in other map iterations. On these maps, the x-axis marks the mindset from which the method comes from. To the left of the axis is "expert mindset;" and to the right is "participatory mindset." In a 2011 article, Liem and Sanders discuss the difference between these two mind-sets at length and suggest that it is difficult for many researchers to transition from one to the other:

> There are two opposing mind-sets evident in the practice of design research today. The left side of the map describes a culture characterized by an expert mind-set. Design researchers here are involved with designing for people. These design researchers consider themselves to be the experts, and they see and refer to people as "subjects," "users," "consumers," etc. The right side of the map describes a culture characterized by a participatory mind-set. Design researchers on this side design with people. They see the people as the true experts in domains of experience such as living, learning, working, etc. Design researchers who have a participatory mind-set value people as co-creators in th e design process. It is difficult for many people to move from the left to the right side of the map (or vice versa), as this shift entails a significant cultural change.

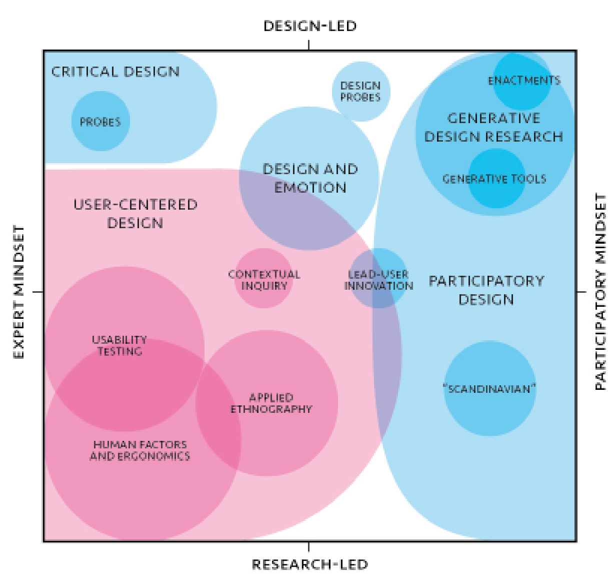

FIGURE 1: A MAP OF DESIGN RESEARCH AND PRACTICE
Elizabeth Sanders, 2008 (Updated 2011 with Andre´Liem)

The y-axis of the map contrasts two approaches to design research; "design-led" approaches are positioned at the top of the map and "research-led" approaches are placed at the bottom.

In their 2011 article, Liem and Sanders present an alternative version of the map that eliminates the tools and methods to reveal three distinct perspectives on design research: Co-creation in the upper right quadrant (participatory mindset x design-led); Design-led in the upper left (expert mindset x design-led); and User-centered in the lower right (expert mindset x research-led). These quadrants reflect differing origins, approaches, and mind-sets that inform the research methods positioned in each quadrant.

Co-Creation: Design-led with Participatory Mindset

Traditional methods of studying users such as interviews, observation, and focus groups provide limited information for the design of future products (Visser, et al., 2005). In contrast, Co-creative design methods have been utilized effectively in the development of new products (Visser, et al., 2005). Liz Sanders and Pieter Stappers define co-creation as, "any act of collective creativity, i.e., creativity that is shared by two or more people" (2008). They suggest that end users can become co-designers, offering expertise throughout the design process. This might be achieved through workshops or generative sessions that ask end-users to create using toolkits provided by designers and researchers. The goal of these sessions is to get users to "say, do, and make" (Sanders, 1999). Sanders suggests, "When all three perspectives (what people do, what they say, and what they make) are explored simultaneously, one can more readily understand and establish empathy with the people who use products and information systems" (1999). Co-

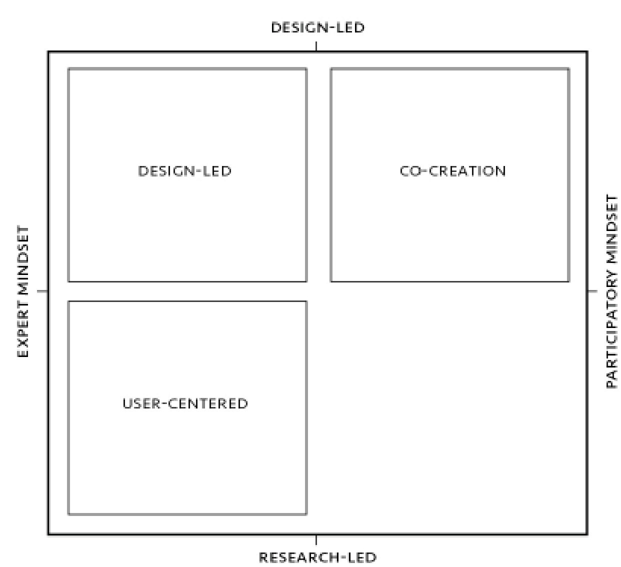

FIGURE 2: FRAMEWORK FOR POSITIONING THE THREE PERSPECTIVES ON NON-TECHNOLOGICALLY DRIVEN PRODUCT DEVELOPMENT PROCESSES
Andre´Liem and Elizabeth Sanders, 2011

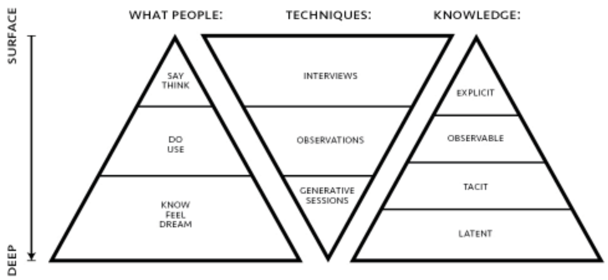

FIGURE 3: CONTEXTMAPPING: EXPERIENCES FROM PRACTICE
Froukje Sleeswijk Visser, Pieter Jan Stappers, Remko Van Der Lugt, and Elizabeth B.-N. Sanders

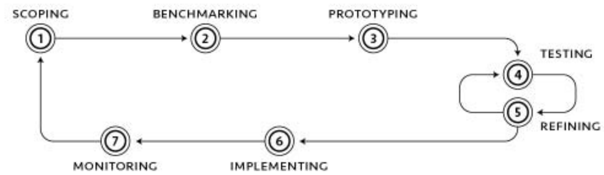

FIGURE 4: INFORMATION DESIGN PROCESS
David Sless, *Measuring Information Design*, Information Design Journal. 2008

creative methods such as generative design sessions attempt to gain insight into end-users feelings, dreams, and latent knowledge through participation in the creative process.

Sanders and Stappers suggest that co-creative approaches have more impact if they are implemented early in the design process: "In our experience as researchers and practitioners, we have seen that co-creation practiced at the early front end of the design development process can have an impact with positive, long-range consequences" (2008)

Co-creative methods may give designers and researchers deeper insight into end-user needs in the design of future products. Used at the front end of the design process, these methods may be able to help designers and researchers gain context, empathy, and understanding.

Design-Led: Design-led with Expert Mindset

To achieve performance standards, this process benchmarks the performance of existing communications and then refines prototypes through an iterative process of testing. Sless suggests that this process can improve the performance of public information and may aid in establishing standardized handling of public communications (2008). Sless also suggests:

> Testing, or more broadly the process of collecting evidence about the performance of a design with people, should occur at three points in the information design process: at the benchmarking stage to establish the current performance of a design, at the testing and refinement stages of a new prototype, and at the monitoring stage when the design is in use and its performance is being tracked to maintain its optimal performance (2008).

In usability testing the end user is no longer participating in the design or creation of the communication system, but is a research subject responding to or trying to operate a prototype or finished design. The results are more quantifiable and as Sless suggests, may help in standardizing communications.

Making Connections

The three quadrants of Liem and Sanders map come from distinct approaches and mindsets. Each offers distinct outcomes that appear to have value at different stages in the design process. Despite Liem and Sanders' suggestion that transitioning from one quadrant to another may be difficult for individuals, the authors believe there is a natural progression from one to another.

Co-creative methods offer designers and researchers the ability to gain deep understanding of end users and their context. Design-led methods such as critical design may give designers space to consider complex factors in a design intervention and then instigate end-users' continued participation in the design process. User-centered methods such as usability testing may provide designers and researchers with quantifiable performance data. Helping to guide the design process and clearly communicate potential outcomes to public or private entities.

Utilizing David Sless' research process and combining it with co-creative and design-led methods the authors propose a model for researching complex public communications. The model progresses from the "fuzzy" front-end of the research to the more concrete performance testing of a prototype. The progression allows for public input throughout the design process without hindering the expertise of researchers and designers.

INITIAL RESULTS

Scoping Phase

The scoping phase of this project included background research, two consumer surveys, and interviews with industry experts. The background research suggests that changes in the FDA, GS1, and food industry are positively impacting the quality of data available for tracking of food in recalls, however the greatest advances are within larger retailers and specific market segments such as fish. The surveys confirmed previous research suggesting the public would like food recall information in-store. They also suggested that the public would like recall information located near where the product was sold. Federal agencies were shown to be the most trusted source of recall information, while online social networks lack public trust.

Co-Creative Phase

Four co-creative workshops have been conducted thus far. Each workshop had between 7-13 participants. The workshops consisted of a pre- and post-test survey, a series of 3 reflective exercises that centered around two fictional recall scenarios, group brainstorming and discussion, and a rapid prototyping exercise that was done both individually and as small groups.

The workshops revealed a number of helpful insights into consumers beliefs about food recalls, including:

- Wording of in-store food recalls must be written carefully so as to not alarm shoppers

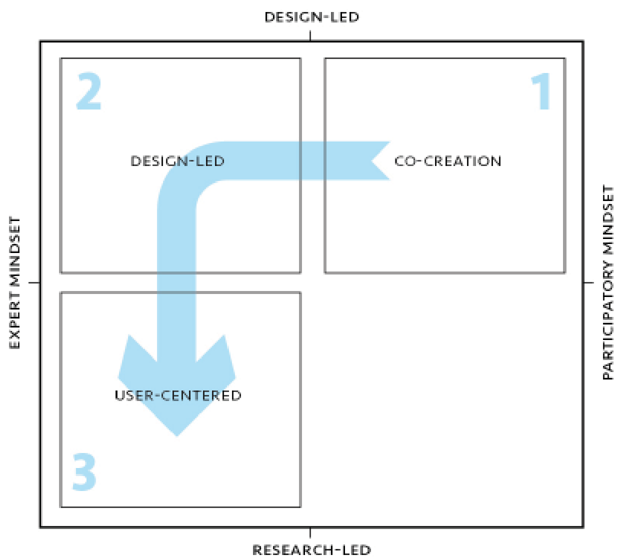

FIGURE 5: PROGRESSION THROUGH HUMAN-CENTERED DESIGN METHODS FOR COMPLEX PUBLIC COMMUNICATIONS
Based on Andre'Liem and Elizabeth Sanders, 2011

- If worded correctly (e.g. 'Did you know…' instead of 'Caution!'), most participants said that they would not be alarmed by food recall notifications in retail settings
- If worded correctly, retailer transparency about recalled products would be viewed positively by most participants
- Participants confirmed the survey preference for recall information near where a recall product had been sold
- Older participants envisioned more digital solutions when prototyping
- Younger (college-aged) participants envisioned more traditional print-based solutions when prototyping
- Color-coding of severity of recalls was a common consideration
- Most participants said that they would like to see 'alert' posts from news organizations on social media or push notifications on their phone
- The use of novel technology like touch-screens and product scanners were not common concepts, but were supported when introduced by participants

The workshops helped gain a deeper understanding of key issues that will be faced in redesigning food recall communications. There wasn't a clear cut consensus on a single prototype solution in the workshop. And participants sometimes had difficulty imagining solutions that were different from something they had seen before, even when prompted to create an absurd solution.

NEXT STEPS

The next phase of the research plan will be a series of critical design workshops that present participants with prototype designs that introduce novel ways of communicating food recalls in a retail setting. Several of the prototypes will be absurd solutions designed to provoke dialogue and reflection with participants. A reflective co-creative rapid prototyping exercise may be utilized after the critical artifacts are presented and discussed. This will give participants a chance to creatively respond to concepts and ideas that the workshop provoked in them.

CONCLUSIONS

Researching and designing for the needs of society when there isn't a public outcry for change can be isolating. Unknown roadblocks lurk around every turn in the research, and questions arise often. Human-centered design methods are essential to understanding the complex context in which food recall communications take place. The methods allow for dialogue between the public, researchers, designers, and potential partners. It is that dialogue that makes this project human-centered and it is that dialogue that gives the context a chance to speak.

REFERENCES

AIGA. 2014. Ballot and Election Design. Retrieved February 5, 2014 from: http://www.aiga.org/election-project/

Barron, L. 2013. Census: Non-English Speakers in U.S. Nearly Triple in 30 Years. Newsmax. Retrieved February 12, 2014

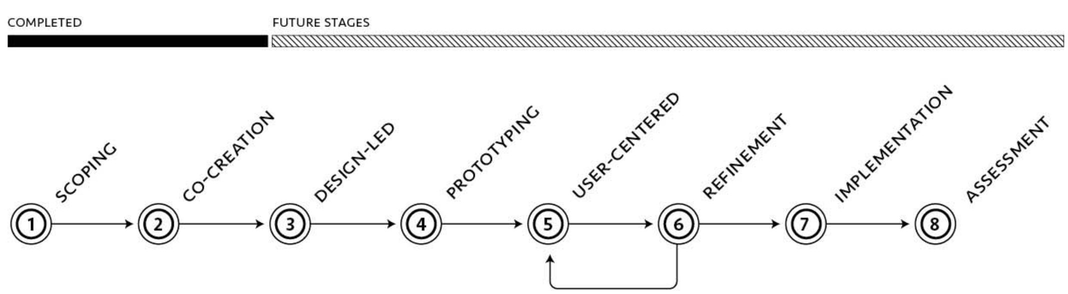

FIGURE 6: RESEARCH PLAN
Current project showing progression from explorative co-creative research to prototyping and user-centered testing of specific functions and features before implementation. Research stages and terminology influenced by David Sless (2008), André Liem and Elizabeth Sanders' (2011).

from: http://www.newsmax.com/US/english-language-speakers-report/2013/08/07/id/519251

Bowen, Simon. 2009. Getting it Right: Lessons Learned in Applying a Critical Artefact Approach. In: Undisciplined! Design Research Society Conference 2008, Sheffield Hallam University, Sheffield, UK, 16-19 July 2008.

Bowen, S. 2010a. Critical Theory and Participatory Design. In: CHI 2010, Atlanta, GA, US, 10-15 April 2010.

Bowen, S. 2010b. Critical Artefacts and Participatory Innovation. In: CHI 2010, Atlanta, GA, US, 10-15 April 2010.

Carlson, C.C., & Peake, W.O., 2013. Rethinking food recall communications for consumers. *Iridescent*, 2, 11-23.

Cuite, C. L., Condry, S.C., Nucci, M. L., Hallman, W.K. 2007. *Public Response to the Contaminated Spinach Recall of 2006*. Food Policy Institute, Rutgers University. Publication number RR-0107-013.

Frascara, J. 2002. People-centered design: Complexities and uncertainties. In Frascara, J. (Ed.), *Design and the Social Sciences: Making Connections*, (33–39). London: Taylor & Francis.

GAO, 2004. *Food Safety: USDA and FDA Need to Better Ensure Prompt and Complete Recalls of Potentially Unsafe Food*. United States Government Accountability Office.

GS1, 2012. Rapid Recall Exchange: Do Your Part For Consumer Safety. Retrieved May 28, 2012 from: http://www.rapidrecallexchange.org/LinkClick.aspx?fileticket=B8Ufl%2fDhFGc%3d&tabid=56.

Hallman, W.K., Cuite, C.L. 2009. *Food Recalls and the American Public: Improving Communications.* Food Policy Institute, Rutgers University. FPI publication number RR-0310-020.

Hallman, W.K., Cuite, C.L., and Hooker, N.H. 2009. Consumer responses to food recalls: 2008 national survey report. Food Policy Institute, Rutgers University. FPI publication number RR-0109-018.

Margolin, V., & Margolin, S. 2002. A 'social model' of design: Issues of practice and research. *Design Issues, 18.4*. 24–30.

Peake, W., Detre, J., Carlson, C. 2014. One Bad Apple Spoils the Bunch? An Exploration of Consumer Overreaction to Food Recalls. Manuscript submitted for publication.

Papanek, V. 1984. *Design for the Real World: Human Ecology and Social Change*. New York: Van Nostrand Reinhold Company.

Quesenbery, W. 2003. Dimensions of Usability. In Albers, M. (Ed.), Mazur, M. B. (Ed.), *Content and Complexity: information Design in Technical Communication*, (81-101). Routledge.

Ryan, C. 2013. Language Use in the United States: 2011. U.S. Census Bureau. Retrieved February 12, 2014 from: http://www.census.gov/prod/2013pubs/acs-22.pdf

Sanders, E. B-N. 1999. Postdesign and Participatory Culture. Useful and Critical: The Position of Research in Design. University of Art and Design Helsinki. Retrieved June 12, 2012 from: http://www.maketools.com/articles-papers/PostdesignandParticipatoryCulture_Sanders_99.pdf

Sanders, E. B-N. 2001. Collective Creativity. LOOP: AIGA *Journal of Interaction Design Education. 3*, 1-6, August. Retrieved June 5, 2012 from: http://www.maketools.com/articles-papers/CollectiveCreativity_Sanders_01.pdf

Sanders, E.B-N., Stappers, P. J. 2008. Co-Creation and the New Landscapes of Design. Retrieved May, 14, 2012 from: http://www.maketools.com/articles-papers/CoCreation_Sanders_Stappers_08_preprint.pdf

Sanders, E. B-N., Simons, G. 2009. *A Social Vision for Value Co-creation in Design*.

Open Source Business Resource, December 2009: Value Co-Creation. Retrieved June 5, 2012 from: http://www.maketools.com/articles-papers/Social_Vision_for_Value_CoCreation_in_Design.pdf

Sanders, E.B-N., Liem, A. 2011. The Impact of Human-Centred Design Workshops in Strategic Design Projects. Human Centered Design, Koruso, M. (Ed.). HCII 2011, LNCS 6776, pp. 110–119, 2011. Retrieved May, 5, 2012 from: http://www.maketools.com/articles-papers/LiemSanders.pdf

Scharff, R. L. 2010. *Health-related costs from foodborne illness in the United States*. The Produce Safety Project at Georgetown University. Washington, DC.

Sless, D. 2008. Measuring Information Design. *Information Design Journal, 16.3*, 250–258

Steelfisher, G., Weldon, K., Benson, J. M., Blendon, R. J. 2010. Public Perception of Food Recalls and Production Safety: Two Surveys of the American Public. J*ournal of Food Safety. 30*, 848-866.

US Congress. 2011. FDA Food Modernization Act. 111th Congress. Public Law111-353-Jan. 4, 2011. Retrieved June 8, 2012 from: http://www.gpo.gov/fdsys/pkg/PLAW-111publ353/pdf/PLAW-111publ353.pdf.

Visser, F., Stappers, P., Van Der Lugt, R., Sanders, E.B-N. 2005. Contextmapping: experiences from practice. *CoDesign International Journal of CoCreation in Design and the Arts, 1-2*. Taylor and Francis.

Waller, P., Stearns, D. 2006. Where's the Meat? The Need for Full Public Disclosure in Meat Recalls. *Journal of Environmental Health. 68.10*, 58-60.

Wohsen, M. 2013. Obamacare Website Is in Great Shape — If This Were 1996. *Wired*. Retrieved February 2, 2012 from: http://www.wired.com/business/2013/12/obamacare-is-ecommerce/

Book reviews

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Sun, H. (2012). ***Cross-cultural technology design: Creating culture-sensitive technology for local users*****. New York, NY: Oxford University Press, Inc.**

In Huatong Sun's recent book, *Cross-cultural technology design: Creating culture-sensitive technology for local users*, the author presents a study of text messaging usage in both American and Chinese culture. Sun introduces the field to her "design philosophy and model of Culturally Localized User Experience" or "CLUE" (xiv-xv). Using the CLUE approach, Sun explores the differences in how a technology such as text messaging has developed, and has been interpreted by users, within each culture, including case studies of specific users. Sun breaks up her book into three distinctive parts: Grounding, Experiences, and Implications.

In the first part of the book, Sun builds a theoretical foundation for the evolution of mobile text messaging in both American and Chinese culture. Chapter 1 starts off with an anecdote of her encounters using a Windows computer in China and then transitioning to a Windows computer in the United States. By describing the experience of this cultural shift, Sun sets the tone for the book's goal: finding a way to design and create meaning for local users with technologies used in cross-cultural settings. The commonly used metaphor of the "iceberg" is called upon in this opening chapter to help illustrate the submerged part of technologies that manufacturers and designers do not see: "the broader cultural context where technological products are situated, designed, produced, distributed, and consumed" (7). The next three chapters in the first section of the book move from looking at the way that local culture is viewed and represented in intercultural research to looking at usability and user experience's lack of socio-cultural context when testing, as well as explaining a little more closely her method of "Culturally Localized User Experience" (CLUE).

After her substantial (110 pages) explanation of foundational theories, in Part Two Sun focuses on the real-life experiences of users in their localized settings. Here five separate chapters each tell a story of the ways in which five different people used mobile text messaging in their own unique contexts. Each participant in Sun's study completed a four-day long diary, which Sun uses to provide case studies of the users using their mobile phones to text, including "text snippets" to show actual conversations.

The first participant in the, Sophie the 30-year old retail manager in America, utilized the convenience of texting to keep in touch with her friends while also at work. She was able to keep it from disrupting her workflow/performance at work, and thus texting enabled Sophie to "negotiate her identities" between the personal and professional spheres of her life (125). Sun uses this first case to explore how meaning and action are connected within an individual's experience with a technology.

The second participant moves the context to China, where Sun focuses on Lili, a 26-year old teacher and student advisor at a local technical college. Whereas Sophie mostly utilized texting for "expressing," Lili mostly used texting to share information with friends and relatives, and did so at a higher percent than the average Chinese text message user. Even though Lili had run into some usability problems, the affordances she encountered while texting were too important to let these issues affect her usage. Lili used a "feminine phone" called the "Dancing Queen," exemplifying how the use of phones and text messaging can be "localized for female social practices" (144).

Through the next three cases, Sun alternates between American and Chinese sites of study, including Brian (a 22-year old graduate student), Mei (a 23-year old graduate student) and Emma (a 20-year old college junior). Each of the cases continues to delve further into the personal, localized culture that each individual experiences while using mobile text messaging.

The third and final part of the book focuses on scholarly. Here Sun helps contextualize her CLUE framework and address her theory that the localized use of text messaging, and similar technologies, needs to be considered for a holistic view of user experience. She continues to talk about her case studies, including data displays such text snippets, tables, and charts. Ultimately, in this accessible, readable, and yet theoretically complex book, Sun advocates expanding the design process of technologies to the sites of localized cultures and getting authentic insight from real users in hopes that it will inspire more "mindful cross-cultural design methodologies for analysis and design to accomplish the unity and harmony of the global and the local" (269).

Book reviews

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Pei-Luen Patrick Rau, Tom Plocher, & Yee-Yin Choong. (2013). C*ross-Cultural Design for IT Products and Services* CRC Press.

The culture we are part of tells us what aspects of design constitute "good" both in terms of aesthetics and usability. When it comes to technologies, these factors must be addressed for a given item to be successfully adopted by and correctly used within a particular culture. To put these ideas into practice, consider the following: A given interface might be very easy for the members of a particular culture to use, but if its aesthetic appeal is so jarring that individuals avoid it almost instinctively (i.e., before they actually use it), then the benefits of that interface are lost. Similarly, an aesthetically appealing interface might entice the members of a given culture to try it, but if the interface is difficult to use, then the initially interested audience is likely to abandon it. Effective communication design for international contexts thus becomes a matter of recognizing and addressing both aspects associated with "good." And as online media increasingly link the world together via information technologies, the need to understand and address such factors becomes increasingly important.

Within this context, the question becomes "What must I address to facilitate *both* aspects of good design for audiences from different cultures?" While no easy answer exists, there are resources that can provide us with models for finding the answers to such questions. The book *Cross-Cultural Design for IT Products and Services* is one such resource. Part reference work, part handbook, the text provides readers with an introduction to (and foundational overview of) key concepts that can affect expectations of design across different cultures. It also presents mechanisms for applying those ideas when creating materials for users from different cultures.

The book begins with a relatively brief, but quite effective, overview of how factors of culture affect aspects of design. In this initial section ("Cross-Cultural Psychology"), the authors summarize factors that can affect cultural communication expectations (e.g., Geert Hofstede's variables of power distance and uncertainty avoidance) as well as psychological concepts such as self and identity (e.g., self-constructural theory) to help readers understand how one's culture can affect everything from his or her communication expectations and perceptions of time to preferences for how to engage in problem solving and decision making. In so doing, the authors provide readers new to such concepts with an effective overview of cultural factors affecting design expectations and preferences. This initial section also offers readers more familiar with such topics a solid review and an interesting model for considering these ideas within the context of communication design. The remainder of the book mirrors this approach of concise but effective overview merged with application to design practices.

The other major sections of the book examine ideas of culture and design in terms of looking at more focused topics within this general theme. For example, the section on "Cross-Cultural Design" (Section II) contains chapters that focus on specific aspects of design including language (chapter 4), color (chapter 5), and format and layout (chapter 7). The major section entitled "Methodology" (Section III), in turn, contains entries that review specific practices and processes related to learning more about a given cultural audience – topics such as doing user needs research (chapter 11) and conducting usability evaluations (chapter 13). Through these sections and chapters, the authors provide readers with a manageable mechanism for focusing on specific topics or practices associated with designing materials for audiences from other cultures. Each of the chapters in these two sections, moreover, are written in a manner that could be described as "self contained." That is, readers do not necessarily need to have read preceding chapters to discuss the concepts being covered in a given entry (a factor that makes the text an excellent quick reference guide).

Each chapter is organized into major thematic sections and sub-sections that provide brief but effective information on a given topic. The chapter on culture and product development (chapter

10), for example, covers topics such as identifying customers, defining concepts, planning product design, and creating final products. The sub-sections in each of these major topical sections then provide a short but rich explanation of the aspects one needs to address when working with that overall theme. This approach allows readers to find specific information quickly and easily. It also helps them see how different themes and sub-themes are connected to a range of subjects associated with an overall topic. These features make the text an effective reference guide or resource for individuals to consult – especially if effective, focused answers are needed quickly.

Additionally, many chapters conclude with a case study that provides readers with an opportunity to see how concepts covered in the chapter can be applied in a particular context. Each case, in turn, is broken down in terms of parallel factors (e.g., methodology, findings, implications of findings), and this structure allows readers to glean key insights from each case as well as to compare cases across chapters. Moreover, these cases tend to be a bit longer and written in a more narrative way that allows the reader to engage quite effectively with them. Their location at the end of the chapter also helps readers see how the information reviewed in the chapter can coalesce and affect different international settings.

Culture is a complex, multifaceted construct, and each aspect of that complexity needs to be addressed in relation to communication design. Accomplishing this objective is no easy feat, but resources such as *Cross-Cultural Design for IT Products and Services* can help facilitate this process. Through a structured approach to examining specific topics, the authors provide the readers with a mechanism for understanding both fine details and overall themes associated with culture and design. Additionally, by providing multiple case studies, the authors give the readers a framework that helps them see how these different factors can converge within a specific cultural context. In so doing, the authors have created an effective reference guide that can be used across a range of fields and within multiple educational and industry contexts.