



The Iterative Design of a Virtual Design Studio

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“Even though our earlier attempts to create online design culture were not wiki-based, they influenced our notions of the need to hide formalism as much as possible.” when we began to experiment with wiki technology.”

Our initial concept for Design eXchange as a shared collaborative online and physical space for design has changed as a result of several iterations. Our present notion places less emphasis on Design eXchange being a place for our students to share their work, and instead favors a complex mix of key elements, namely 1) a virtual online studio, 2) a forum for review of all things related to design, especially design with the materials of technology, 3) individual, group, class, program, and public spaces supported by a logic of permissions for access and sharing, and 4) a vision for supporting design knowledge, credentials, community, and guild.

The wiki-based technology we are using for the Design eXchange is in its second iteration and—largely due to the more pervasive awareness of wiki culture—is enjoying considerable success compared with earlier attempts. This article describes the progression of form for the Design eXchange, as well as the projects that preceded and inspired it.

Our research is motivated by a desire to create and support design culture in the context of design in general and human-computer interaction design in particular. For the past two years, we have been using wiki technology to accomplish this. Although our use of the wiki is targeted at this specific context rather than the study of wikis as a technology in-and-of-itself, we are so delighted by our experience and vision for the future that we believe that our reflections on this experience and vision will be of great interest to the wiki development community. Moreover, the twin goals of supporting design culture and making an effective choice of mechanisms for so doing are not separable. We describe in this paper that our specific context of supporting design culture changes how we think about using a wiki and equally that our use of the wiki changes our

vision for how to best support design culture. Our report is of interest to anyone concerned with virtual collaboration for design, as well as the application of wiki technologies.

Design issues and background

Christopher Alexander’s early writings on Pattern Languages (Alexander, Ishikawa, & Silverstein, 1977) have formed the basis for attempts to create reusable, codifiable knowledge in design. It is known to the wiki research community that Pattern Languages formed part of the experience that allowed Ward Cunningham’s invention of the wikiwikiweb (Cunningham & Leuf, 2001; Wikipedia, 2006). The importance of Alexander’s pattern language both in design and in the history of the wikiwikiweb is an interesting and salient point of comparison between our work to support collaborative construction of design knowledge and the wiki way in general.

The differences between formalism—representations structured according to model-theoretic semantics and proof-theoretic syntax as in mathematical logics—and patterns in design and object-oriented design are significant and profound. Figures 1 and 2 are examples of design patterns—which we called design explanations (Blevis & Siegel, 2005)—as we constructed them in early versions of the Design eXchange. Figure 1 shows a design explanation based on Alexander’s shopfront schools pattern (Alexander, et al. 1977, p. 424-425). Figure 2 shows an elaborated pattern based on an extended notion that expands Alexander’s shopfront schools pattern to one of distributed learning in general. These patterns are not the same as patterns in the object-oriented programming sense; rather the propositions themselves reflect human behaviors rather than program behaviors and are not easily reducible to formal objects. We referred to the propositional, constituent elements of design explanations as components. In our

first iteration of the Design eXchange as a wiki we sought to create a one-to-one correspondence between components and a single type of article in the wiki sense of the words article and type.

We wanted to regard these design explanations as fundamental patterns or units of design knowledge. This conception is not unlike the design rationale work by Moran and Carroll (1996) and others in the mid '90s and it suffers in the same way from being difficult to share since many designers are either intimidated by or object to such formalisms.

TITLE:
A Shopfront Schools Variant

PREDISPOSITIONS (VIEWPOINTS):
 Everyone is entitled to an education.
 There aren't always enough resources to go around.

RESEARCH-OBSERVATIONS:
 Some of the townspeople in college towns have never been on the campus; universities are sequestered from the general public.

INSIGHT:
 To make education accessible to everyone, it's a good idea to move the physical campus into the community with less intimidating artifice.

CONCEPT:
 Shopfront schools, after Alexander, et al., 1977: Pattern No.85.

PROTOTYPE:
 Study Sylvan Learning Systems as an example of Shopfront Schools.

STRATEGY:
 Evaluate effectiveness of existing Shopfront education enterprises and develop plan for improvement, perhaps integration with other forms of democratization of learning.

Figure 1: Design explanation example fragment, simple.

We still believe that constructing an underlying formalism is possible and indeed it is necessary if we want to claim that we have adequately represented design knowledge. However, such representations are not suitable for creating an inclusive collaborative online design community. Even though our earlier attempts to create online design culture were not wiki-based, they influenced our notions of the need to hide formalism as much as possible when we began to experiment with wiki technology.

Our early efforts included the what-before-how tool—application software which would help designers think in an object-oriented way in the context of a design school. The what-before-how tool encouraged designers to think of design problems in terms of the nouns and verbs (objects and actions) of present situations; the nouns and verbs of desired, future situations; and transformations from present situations to desired ones. The what-before-how tool diagrams looked a lot like object-oriented diagrams except that the intention was to describe human behaviors rather than program behaviors or interactions. Figure 3 shows some sample screens from the what-before-how tool.

TITLE:
 Distributed Learning
 [meta-data: distributed services, democracy, equality]
 PREDISPOSITIONS (VIEWPOINT):
 P1: Everyone is entitled to an education
 [meta-data: democracy, parity of participation, education, equality]
 P2: There aren't always enough resources to go around
 [meta-data: zero-sum, scarcity of resources]
 RESEARCH-OBSERVATIONS:
 P1,P2 →O1: Some of the townspeople in college towns have never been on the campus; universities are sequestered from the general public.
 [meta-data: sequestering, privilege]
 P1,P2 →O2: Not everyone can afford to attend the best colleges or universities.
 [meta-data: sequestering, privilege]
 P1,P2 →O3: Internet technologies enable wider distribution of quality materials in the same manner that the introduction of recording technology enabled people to listen to the best performers.
 [meta-data: technology enablers, networking]
 INSIGHTS:
 O1→I1: To make education accessible to everyone, it's a good idea to move the physical campus into the community with less intimidating artifice .
 [meta-data: belonging, equal distribution of resources, community services]
 O2,O3→I2: To make education accessible to everyone, it's a good idea to distribute it more widely.
 [meta-data: equal distribution of resources, distributed delivery of services, remote delivery of services]
 CONCEPTS:
 I1→C1: Shopfront schools
 [meta-data: highly-distributed services, retail model]
 I2→C2: Distance education
 [meta-data: networked services]
 PROTOTYPES:
 C1→Pr1: Study Sylvan Learning Systems
 [meta-data: actual example of the concept]
 C2→Pr2: Study Existing Distance Education efforts
 [meta-data: actual examples of the concept]
 STRATEGIES:
 Pr1→S1: Evaluate effectiveness of existing Shopfront education enterprises and develop plan for improvement, perhaps integration with other forms of democratization of learning.
 [meta-data: competitive intelligence, integration, partnership]
 Pr2→S1: evaluate effectiveness of existing distance education enterprises and develop plan for improvement, perhaps integration with other forms of democratization of learning.
 [meta-data: competitive intelligence, integration, partnership]

Figure 2: Design explanation example fragment, complex.

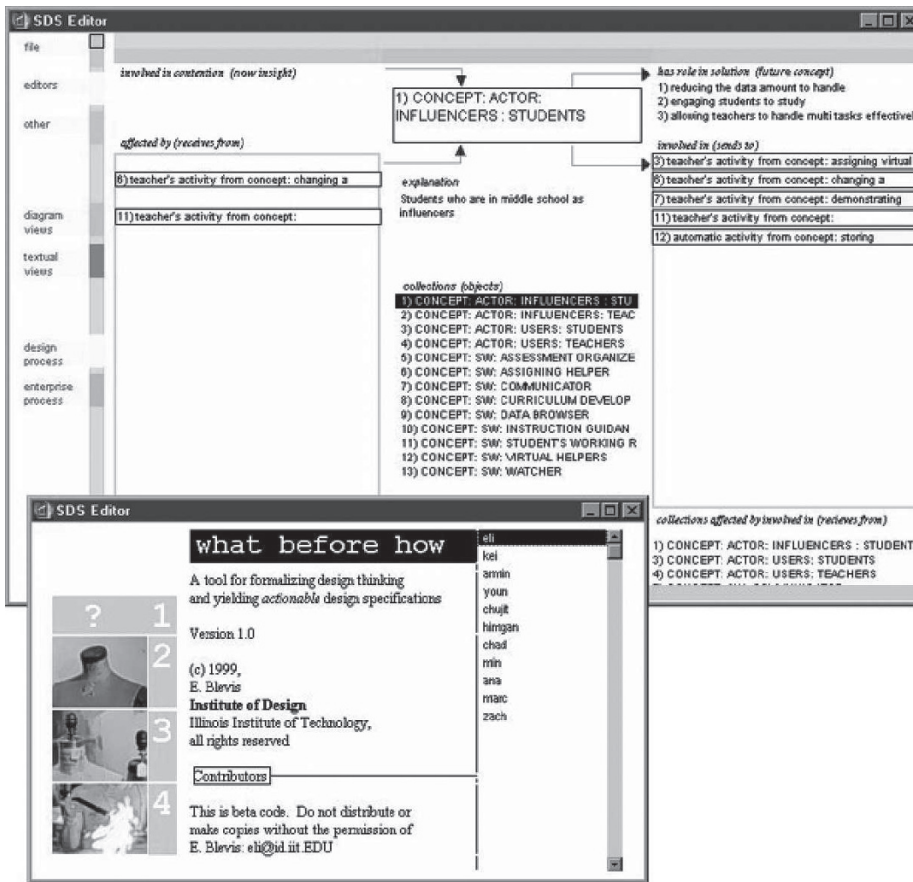


Figure 3: The what-before-how tool.

The original MABTA project suffered some criticism for being too formal to be used easily by designers. More recently, we have looked for ways to relax the formalism while preserving the benefits and intentions of the MABTA approach (Lim, Rogers, & Mehta, 2005).

Our experience with these efforts to create virtual design culture exposed a dilemma. On the one hand, we wanted to create formalizable, reusable objects of design knowledge as the basis for our shared design community and on the other hand the more formal these objects became, the less likely we would be able to include a larger design community. The idea of creating shareable design knowledge has produced a dialectic in the design literature between those who believe that formal description is possible and those who find it too reductive. An even-handed discourse on this topic is perhaps best evidenced in Victor Margolin's *The Politics of the Artificial* (2002), a play on words referencing Herbert Simon's *The Sciences of the Artificial* (Simon, 1996). Margolin's essay, *A Tale of Two*

Even though we found the formalism of the what-before-how tool appealing, we soon realized that our intended use was too formal for design students and not formal enough for software engineers. Our goal of allowing design students to translate automatically their action-oriented visions for human behaviors into object-oriented specifications of program behaviors remained elusive, stalled by the barriers of perceived formalism.

The first implementation of the Design eXchange as web application software (Figure 4) emphasized a card metaphor in an attempt to hide formalism from designers. The Design eXchange web application was short-lived as we abandoned it in favor of the wiki-based iterations of the Design eXchange.

In related research, Lim devised the Design Information Framework (DIF) as a framework to support interdisciplinary collaboration in design (Lim & Sato, 2001). This framework defines and disambiguates design terms such as actions, interactions, functions, and objects that otherwise might lead to misunderstandings among members of multi-disciplinary design teams due to the overloading of meanings of such terms from one discipline to another.

One project that used this framework was the Multiple Aspect-Based Task Analysis project (MABTA) (Lim, 2004). The goal of MABTA was to develop a task analysis approach for understanding collaborative work in order to provide a foundation for designing interactive systems.

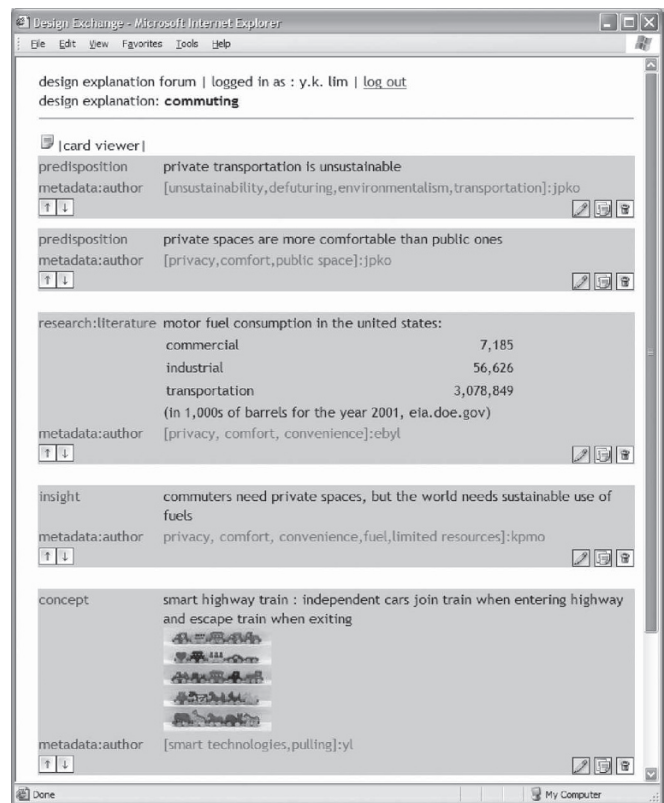


Figure 4: DESIGN EXCHANGE application, early version.

Herberts (2002) compares Simon's account of design and Herbert Dreyfus' account of design.

Alexander's work (2002) on the nature of order is different and far less formal in many ways than his earlier work on pattern languages. In volume two of his four-volume treatise, Alexander emphasizes his idea of structure-preserving transformations—a concept that examines the role of reuse in nature and sets it as a clear goal for the design of the artificial. No other online technology has done as much to create reuse as the wiki, so there continues to be a correspondence between Alexander's writings and the wiki context. The idea of structure-preserving transformation inspired us to create an online environment of reuse that worked organically and did not require a commitment to specific formal representations.

In our context of use of wiki technology, we are concerned with a culture that is physically-oriented more than it is virtually oriented. Design culture takes a number of forms: the physical environments of design studios in businesses and schools; print publications such as International Design (I.D.) and Visible Language; conference proceedings of the Design Research Society conferences; a handful of peer-reviewed journals including Design Issues, Design Studies, Design Philosophy Papers, and Artifact; a limited use of online resources, including the PHD-design listserv, as well as a number of traditional websites which provide links to design resources; and design competitions.

Another way to characterize design culture is to enumerate some of the literature that defines the field. A bibliometric study describing the landscape of thought about design appears in Atwood, McCain and Williams (2002). Other articles critical to our understanding of design include Cross (2001), Fallman (2003), Löwgren and Stolterman (2004), Nelson and Stolterman (2003), Norman (1990), Schön (1983), and Winograd and Flores (1986).

The nature of design studios

For the purposes of this article and to avoid the philosophical discourse about the nature of design and design culture, we take a pragmatic view of defining design culture simply as the activities that take place in a design studio.

A design studio is creative, collaborative, and highly material, dominated by material objects—surfaces for sharing ideas and inspiration, and Post-it Notes, sketches, magazine scraps, models, and physical prototypes to make ideas visible and tangible. The shared and personal spaces of a design studio are created by walls and other less permanent vertical surfaces that are decorated with images, diagrams, sketches, and objects related to design work-

in-progress. The persistence of these images supports the design process, serving as collective memory and external cognition for the design teams. Many of the objects in a design studio may have seemingly little to do with the projects at hand, but in fact serve to challenge and inspire new ideas, to create cross-contextual reminders that lead to breakthrough thinking and conceptualization.

Setting up a workspace as a design studio with work-in-progress in clear view invites critique and fosters the practice of showing work and eliciting feedback early and often—a phrase used by Patrick Whitney of the Institute of Design to describe an ideal design culture and practice. There is a beehive effect in a fully functional design studio that encourages and emphasizes sharing and collaborative interaction over individual work.

Wikis simulate for the virtual world much of what we are describing of the physical world of design studios and design studio culture. For instance, wikis may allow everyone to view work-in-progress. They distinguish between articles, discussion, and history, just as the design studio distinguishes between work-in-progress, critique, and persistence of design process objects.

Some controversial aspects of wikis, such as walled gardens, protected pages, restrictions on anonymous editing, and exposure to vandalism, are also issues in our analogy between physical world design studios and wikis. Design studio culture and etiq-

uette maintain intricate permissions related to viewing work-in-progress, editing work-in-progress, attribution of ideas, and respect for the workspace of others. Designers are seldom inclined to touch the work of others until invited to do so. There is a relatively high degree of privacy afforded to a designer who may choose over time to relax restrictions on who is permitted to view work at whatever stage—thus, the degree of privacy for design work-in-progress can change as circles of designers involved in a project expand or change.

Creation of an online virtual design studio culture using wiki technology has natural correspondences between the spirit of the wiki and the practices of physical world design culture. One of the most salient motivations for experimenting with this connection is the capacity of both media for emergent and implicit organization of knowledge, rather than prescribed and explicit formalisms.

The Design eXchange wikis

Two iterations of the Design eXchange as wikis have been used as course management systems for a studio-style graduate course in human-computer interaction design (HCI/d) at the School of Informatics where we teach. The pedagogical context has made it possible to design the Design eXchange in a participatory way. Nonetheless, our

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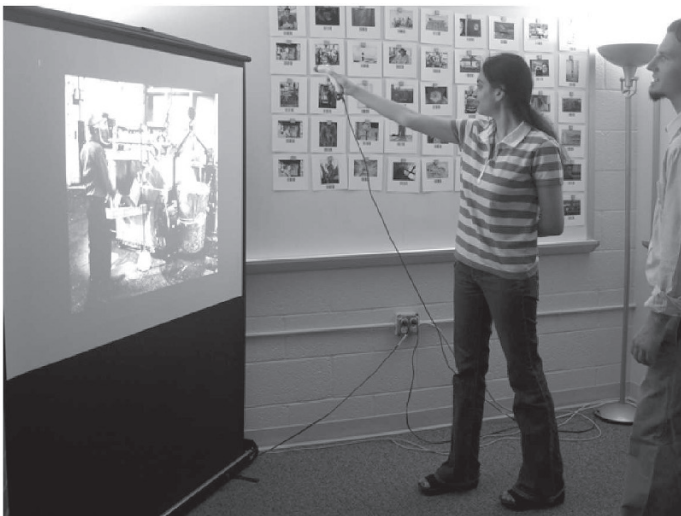


Figure 5: Working with physical barcoded cards in a design study for the DESIGN eXCHANGE wiki.

goals for the Design eXchange are not specifically pedagogical. Rather, we hope our construction of the Design eXchange will support a virtual design studio culture in general.

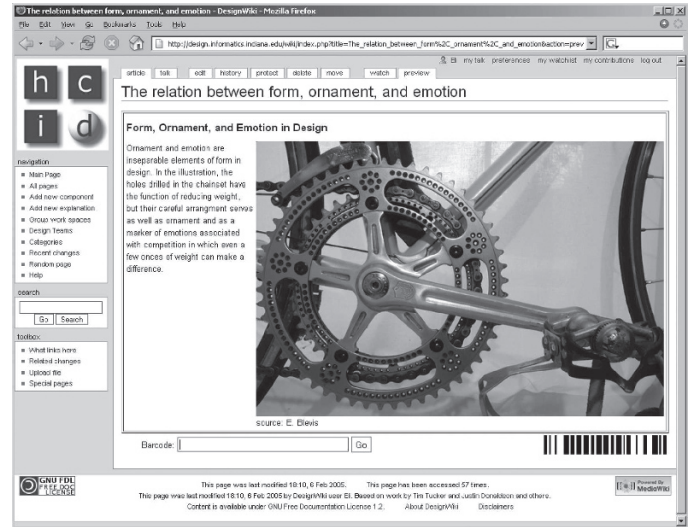


Figure 6: A barcoded design component from the first iteration of the DESIGN eXCHANGE.

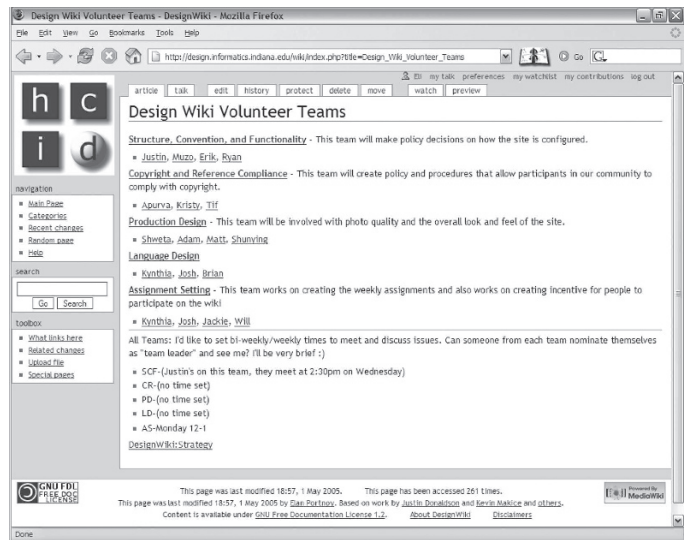


Figure 7: Schedule of participatory design teams from the first iteration of the Design eXchange.

The first iteration

The goal for the first iteration of the Design eXchange wiki was to provide a sense of virtual studio space for students in the graduate course in HCI/d, given that we actually lacked physical studio space. A core idea for this first iteration was to mix some aspects of the physical world studio with the virtual world wiki. We wanted a way to print out wiki articles as physical cards, and we wanted a way to have those cards index back into the wiki. In order to do this, we added a barcode to every article and created a program that would scan a barcoded card which could later pull up the associated virtual article and its illustrations. Figure 5 shows an image of the barcoded cards and their use as a mechanism for mixing physical and virtual support of design studio culture. For a complete description of the studies and the first iteration of the Design eXchange, see Blevis, Lim, Ozakca and Aneja (2005) and Blevis, Lim and Ozakca (2005).

The idea of using cards in design process is well known and well researched in the HCI literature (Biddle, Noble, & Tempero, 2002; Muller, 2001). The practice of assembling information in vertical physical space is a pervasive and essential practice of designers, even if it is not novel. We hoped that the barcode strategy would encourage members of the virtual community to take the design elements away from the screen and onto the wall in order to affect designerly culture.

Figure 6 shows a barcoded article from the first iteration of the Design eXchange. Figure 7 shows how we constructed volunteer teams to be responsible for different aspects of wiki.

At first, we respected everything native to the MediaWiki we used. We allowed anyone to create a login and we allowed anyone to see and edit anything. It was not long before a couple of malicious accounts were created and vandalism occurred, resulting in our decision to close the wiki to people who were not known to us. Also, by the end of the class, some students felt that their work might have economic value and, by popular request, we eventually closed off the wiki from public view.

The second iteration

We learned a number of things from our first iteration of the Design eXchange wiki.

First, we realized that we needed to do a lot more to create online virtual design studio culture than adding barcoded cards or creating a community which was focused only on its own creative output. The barcoded cards were not much used because they required vertical surfaces for the design students to post them to create the persistent images that support the design process. Also, the design students were not much interested in each other's work and there was no mechanism in place that encouraged them to create shared design knowledge.

Second, we realized that to simulate design culture, even in the classroom, we needed to provide a forum for review of all things related to design, and not just individual student

work. We needed to find a way to have members of our virtual design community look outward and construct a place for enduring design knowledge and reflection.

Third, we realized that a fully open wiki could not capture the intricacies of attribution and permission needed to simulate design culture. We are aware of the need to discourage wiki walled-gardens and to hide attribution in the information overload of the history mechanism. Nonetheless, concern for attribution and personal control of permissions to view and edit are pervasive elements of real world design studios and design culture, and we wanted to provide support for design that is respectful of such concerns.

Finally, we realized that our first iteration fell shy of our ambitions to create an online virtual design studio in the sense of creating a globally accessible resource for design knowledge, for building a sense of a larger design community, for creating a forum in which designers could create a sense of identity, or even a notion of guild or a foundation for a system of credentials.

The second iteration of the Design eXchange included a number of features to address these concerns. A display from this second iteration of the Design eXchange is shown in Figure 8.

In the second iteration, we omitted the barcoded cards idea with the intention of putting this feature back later when we have acquired physical space to support our design intentions, we looked for ways to encourage our design students to view the Design eXchange wiki as a place for reviewing and identifying interesting design work in the world as an outwardly looking activity as much as an inwardly looking repository for work within our community, and we included a skills exchange tool to support scheduling of informal learning opportunities. Also, our design students engaged in service learning with community partners and the groups they formed to become the sub-wikis in our wiki farm—these sub-wikis became the analogy of online virtual design group studio space.

The second iteration of the Design eX-

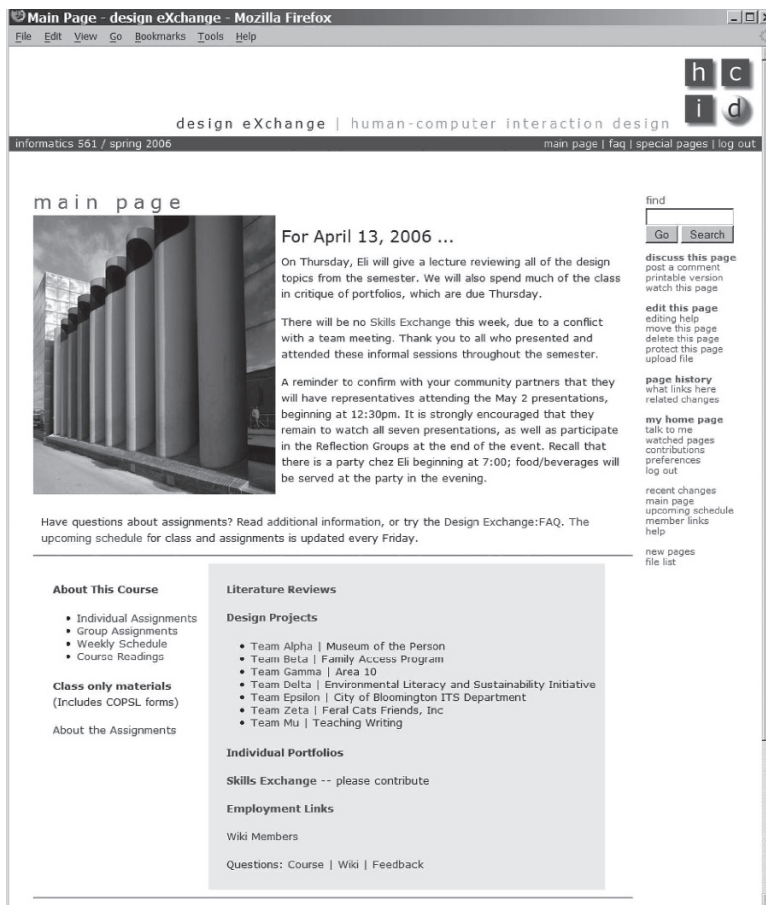


Figure 8: A display from the current Design eXchange wiki.

change wiki was far more effective than the first. While as many students objected to the first Design eXchange wiki as embraced it, nearly all of the students found the use of the second Design eXchange wiki to be natural. Colleagues familiar with the student design work from last year were invited to view the work from this year and found it to be enormously improved. Another evidence of the success of the second iteration is that all of the design students produced their work more steadily, evenly, and earlier than last year.

Nonetheless, there are many things that we have not yet incorporated into the design of the Design eXchange wiki that we intend to include in next year's version. We have a vision of extending the Design eXchange wiki well beyond the confines of a class and to offer support for a virtual design studio culture for our entire program in human computer interaction design and perhaps for an even larger community, certainly those with other design-oriented programs.

Technical notes

It is not the goal of the Design eXchange to push the boundaries of wiki technology. Rather, we are focused on showing a context-directed use of wikis. Nonetheless, there are ways in which we believe our use of wikis is interesting from a technical perspective.

Designers care deeply about appearance, especially about ensuring that visual form follows from and enhances intended meanings. One of the most appealing properties of the wiki, therefore, is the ability to customize the skin of the wiki to move away from the default look offered by programmers.

While the MediaWiki engine does not provide a web interface to make these changes, the code is constructed to facilitate custom design of the web template for the wiki. A single PHP page—created to generate a new layout for the wiki—is recognized in the preferences control panel that permits each user to select from a range of available skins. CSS and image files can be grouped together and referenced from a single subdirectory in the file hierarchy, making the new designs portable. The system allows rapid changes in appearance as well as access to functions through the inclusion or exclusion of specific links.

Since many skins are published for user selection, the wiki also opens up the possibility of comparative design and iteration. The same content and underlying functionality is unaffected by changes to the wiki skin. It is a simple matter to switch from layout to layout and illustrate the evolution of a visual design. When coupled with an implementation of a wiki farm, additional consideration must be taken about naming conventions, file location,

and distribution of changes. We expect that designers who use the wiki may want to use this ability to change the appearance when creating their own prototypes. In fact, two of the authors are presently using TikiWiki to construct prototypes for a project funded by the Public Broadcasting Service (PBS).

Another technical property of the Design eXchange is the use of public and private spaces. The Design eXchange is an example of a wiki farm. It leverages the same database table to provide a list of valid users for the entire system, but relies on site-specific schema to manage content and user permissions. The result is a mechanism by which an author can log in once and rely on the various installations of the same engine to determine which content can be accessed or edited.

Restrictions from universal editing were addressed through a combination of custom permissions, user groups, and wiki template pages. Public viewing of the Design eXchange is possible only for selected pages in the main wiki, currently limited to content describing the schedule and assignments for a second-semester graduate design course. Accounts can only be created by administrators in the sysop role, eliminating issues of spamming and vandalism by unknown authors. Editing of the main wiki is granted to users belonging to a custom teammates group. Individual wikis within the farm have a guest group for wiki authors, configured to allow read-only access.

While a permissions system may run counter to the wiki philosophy of open authoring of content, it is a necessity here to provide student designers with a safe environment to develop projects. We care about attribution as well as collaboration, in ways not necessarily intended—even actively discouraged—by other wiki contexts. For example, only sysop users may change wiki templates that provide course information and assignment due dates. This is not done out of fear of vandalism, but rather to guard against accidental edits by new wiki users who might compromise vital information. This is a valid concern, especially early in a class when mistakes could create confusion and ultimately resentment of the medium.

Leveraging the same username and password is key to the farm working. Although they are not used much in the Design eXchange, interwiki links to reference pages between the main site and the farm sites add another means of integrating content. This farm does not yet address the issue of redundant code—the same core PHP files could be utilized by all wiki installations, rather than duplicating the directory structure again and again. Also of interest is

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granting the author control to promote content from private to a public state when work is ready to share. These issues will be worked out in the next iteration.

Our vision for a global community of virtual design studios using wikis

Our vision for the future is ambitious and extends well beyond our experience which prompts us to go beyond the physical world studio. Inspired by the power of the wiki, we believe that it is possible to create a global community of designers linked together by an ecology of virtual design studios in a manner that goes well beyond what is possible in the physical world alone.

The second iteration of the Design eXchange worked better than the first in part because we allowed private spaces for group work implemented as different wikis in our wiki farm, shared spaces for class-only work by restricting access to those with accounts, and shared spaces viewable by anyone within a larger community. This approach not only better simulated physical world studio space, it also allowed students to engage in design in space defined by spheres of access. It is well known in psychology that many people are more comfortable sharing things in smaller groups than in larger ones. Issues of student copyright, for example, and sharing of otherwise published or publishable materials were avoided by gates of permission afforded by the wiki farm we created. Our use of the wiki farm as an agency of permissions is deliberate and the proof of our need to do so was in the better results we achieved. Our choice of wiki technology was fully justified by its ability to allow for easy editing from any browser. This turned out to be the baseline feature that made the Design eXchange wikis work so well when compared with other approaches to design student construction of web material.

A vision for a community of virtual design studios based on wiki technology must consider individuals and their roles in the design community. We imagine that each design student who enters our program will be given a wiki as a repository for personal work, portfolio, contacts, resume, links to teamwork—anything where the level of access to viewing or editing is best controlled by that student. The advantages of this wiki-based strategy are that the design student can edit her or his site from any browser, the look and feel can be made to be uniform across the whole collection of wikis, and regarding all of the design student wikis as a farm allows for a single login and password combination to grant access to the wikis of others where appropriate. In the real world, a design student in a studio-based design school is given a desk proximate to other design students and the space is arranged to afford some privacy but also a great deal of interaction between design students.

Likewise, each instructor, each class, our school, other schools, designers, design firms, design galleries, and a design guild will have a unique wiki within a wiki farm. Our idea is that as a default, individuals who create wiki objects can choose in which wikis in the farm the object can appear. The choice of a wiki is analogous to physical world

design spaces, where the degree of public access or privacy of an object is governed by choices about which spaces will include that object.

For example, literature reviews done in a class may be of high enough quality to be of potential interest to all designers and may be “promoted” after the class to a design resources wiki available to anyone. As another example, a design firm may have some work in progress that must be kept private and other work that it makes public to help build its reputation. Imagine that the firm makes public the work it wants people to see by “promoting” it to a wiki in the farm that provides a forum for design firms to show their work. Perhaps such a forum is a design contest wiki in which some of the submitted designs are given award status and prestige while others are found to be unworthy of public view.

These various wikis would form an ecology in which the emergent organization depends on who has permission to see what in each wiki in the farm. Moreover, once something has appeared somewhere, anyone with permission to see that level also has permission to push the object to another wiki, effectively enlarging or restricting the sphere of access—the details of such a system are quite complex. For example, we would not want someone to restrict an article from the view of anyone who has already edited it.

It is not sufficient to consider all that we have described is implementable with interwiki links. We also need to make the emergent organization of the ecology of wikis visible to designers so that they understand the level of formality of each article depending on where it appears in that ecology. We don’t know all of the details about how to make this ecology visible—this is a goal for future research.

We have concluded that to truly support virtual design studio culture, we need to simulate different design spaces for individuals, groups, and whole societies of designers. In our vision, a wiki farm can serve to implement an ecology of virtual design studios and with use of permissions, it can support designer control over circles of influence and awareness. The initial sketch we made for the design of this vision and a screen snapshot of how this vision has been implemented in the version of the Design eXchange that is in use at this time are shown in figures 9 and 10 respectively on the next page.

Summary

Our journey in the development of the Design eXchange has taken us a long way and there is a long way yet to go. We began with a vision for encoding design knowledge and creating online virtual design studio culture and found the wiki technology to be an exciting way to make progress towards many of our goals. On the other hand, our use of the wiki technology has itself inspired us to think differently about our original goals for the Design eXchange. Especially as a result of our experience with the wikis, we now realize the importance of allowing for analogies of public and private spaces in the virtual world to reflect physical world design culture and practice. We have understood the

Virtual Design Studio Lens	Levels	Viewable by whom	Ability to promote to a more public view or edit
	Personal Studio	Owner, Others with explicit permission to view particular things	Owner
	Group / Community Studios	Group Members, Others with explicit permission to view particular things	Group Member
	Class/Team Studios	Class Members, Others with explicit permission to view particular things	Professor (promote) Class Member (edit)
	Department Studio	Department Members, Others with explicit permission to view particular things	Director (promote) Department Member (edit)
	Cross-Institutional Studio	Cross Institutional Group Members, Others with explicit permission to view particular things	Collaborators

Figure 9: Figure 9. A logic of permissions for the present implementation of the Design eXchange.

need for an ecology of wikis to support communities of virtual design studios and we have understood the need for thinking deeply about permissions in order to create circles of influence and awareness among designers in our on-line community.

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References

- Alexander, C. (2002). *The nature of order: Vol. 2*. Berkeley, CA: The Center for Environmental Structure.
- Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction*. New York: Oxford University Press.
- Atwood, M. E., McCain, K. W., & Williams, J. C. (2002). *How does the design community think about design? Designing Interactive Systems DIS2002*. London, UK.
- Biddle, R., Noble, J., & Tempero, E. (2002). *Reflections on CRC cards and OO design*. Proceedings of the Fortieth International Conference on Tools Pacific: Objects for Internet, Mobile and Embedded Applications. Sydney, Australia.
- Blevis, E., Lim, Y. K., & Ozakca, M. (2005). The design exchange: A collaborative online community for designers based on shared construction of design knowledge. *11th International Conference on Human-Computer Interaction: Online Communities and Social Computing*. Las Vegas, NV.
- Blevis, E., Lim, Y. K., Ozakca, M., & Aneja, S. (2005, April 2-7). Designing interactivity for the specific context of designerly collaborations. *ACM CHI 2005 Conference on Human Factors in Computing Systems*. Portland, OR.
- Blevis, E., & Siegel M. (2005). The explanation for design explanations. *11th International Conference on Human-Computer Interaction: Interaction Design Education and Research: Current and Future Trends*. Las Vegas, NV.
- Cross, N. (2001). Designerly ways of knowing: Design discipline versus design science. *Design Issues* 17(3), 49-55.
- Cunningham, W., & Leuf, B. (2001). *The wiki way: Quick collaboration on the web*. Addison-Wesley.
- Fallman, D. (2003, April 5-10). Design-oriented human-computer interaction. In G. Cockton & P. Korhonen (Eds.), *Proceedings of the ACM CHI 2003 Human Factors in Computing Systems Conference*, Ft. Lauderdale, FL, 225-232.

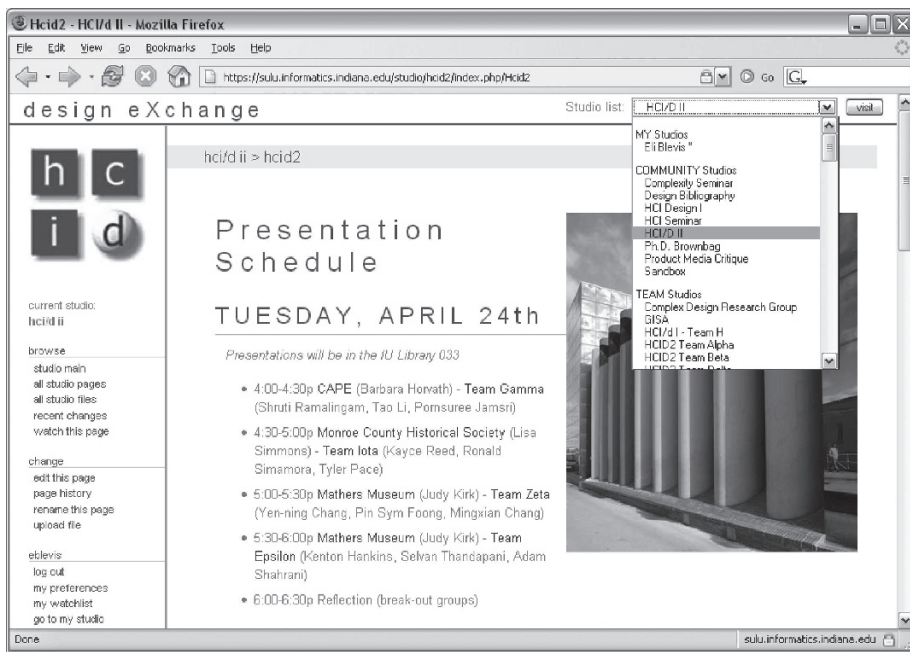


Figure 10. The present iteration of the Design eXchange showing the possibility of selecting different virtual studios.

Lim, Y. (2004). Multiple aspect based task analysis (MABTA) for user requirements gathering in highly-contextualized interactive system design. *Proceedings of Tamodia 2004*, ACM Press, Prague, Czech Republic.

Lim, Y., Rogers, Y., & Mehta, K. (2005, October 27-28). Designing an environment for co-located collaborative analysis of user experience. *Proceedings of Workshop of In-Use, In-Situ: Extending Field Research Methods (BCS-HCI)*, London, UK.

Lim, Y., & Sato, K. (2001, October). Development of design information framework for interactive systems design. *Proceedings of the 5th Asian Design Conference, International Symposium on Design Science*. Seoul, South Korea.

Löwgren, J., & Stolterman, E. (2004). *Thoughtful interaction design: A design perspective on information technology*. MIT Press.

Margolin, V. (2002). *The politics of the artificial*. University of Chicago Press: London.

Moran, T. P., & Carroll, J. M. (Eds.). (1996). *Design rationale: Concepts, techniques, and use*. Mahwah, NJ: Lawrence Erlbaum Associates.

Muller, M. J. (2001). *Layered participatory analysis: New developments in the CARD technique*. ACM CHI 2005 Conference on Human Factors in Computing Systems. Seattle, WA.

Nelson, H., & Stolterman, E. (2003). *The design way - Intentional change in an unpredictable world*. New Jersey: Educational Technology Publications..

Norman, D. A. (1990). *The design of everyday things* (2nd ed.). New York: Doubleday.

Owen, C. L. (2001). *Structured planning*. Chicago: The Institute of Design, IIT. Retrieved April 1, 2006, from http://www.id.iit.edu/papers/Owen_theoryjust.pdf

Schön, D. (1983). *The reflective practitioner*. London: Temple Smith.

Simon, H. A. (1996). *The sciences of the artificial* (3rd ed.). Cambridge, MA: MIT Press..

Wikipedia. *Ward Cunningham*. Retrieved April 1, 2006, from http://en.wikipedia.org/wiki/Ward_Cunningham

Winograd, T., & Flores, F. (1986). *Understanding computers and cognition: A new foundation for design*. New York: Addison-Wesley, Inc.

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