

UPHOLDING THE POETIC IN DESIGN COLLABORATION

JANE R. BURRY, ANDREW L. BURROW, MARK C. BURRY
*Spatial Information Architecture Laboratory, RMIT University, GPO Box
2476V, Melbourne 3001, Australia.*
jane.burry@rmit.edu.au; andrew.burrow@rmit.edu.au

Abstract. Design is a fundamentally collaborative activity. It commonly calls on a wide range of expertise and is arguably most effective when all contributions can be considered from an early and highly conceptual phase of the process. The sharing of information, particularly in a process that, at its best, involves collective conceptualisation is complicated by the very close and reciprocal relationship between the partial knowledge about the object of design and the mode of expression or representation of these ideas. As the design process and its numerous inputs, iterations and interrelationships become embedded in the communications; knowledge capture, management and access become central issues. This paper will selectively recount some of the substantive evidence for the characteristics of communication environments most supportive to design collaboration. In response to these findings it will introduce the use of wiki as the basis of an environment to provide this support, provide more detailed examples of the ways in which wiki has been adopted in early collaborative experiments and describe the developments currently being implemented, and how these are being tested in use.

1. Introduction

“very often, then, it is in the opposite of causality, that is, in reverberation, (.....) that I think we find the real measure of the being of a poetic image.”(Bachelard, 1964)

This idea of striking a note that resonates in a very universal way, not wholly determined by the nature of the source, is very important to the reality of working together creatively to make something new. This *sonorous* quality is particularly important to preserve where the range of collaborating design participants from different disciplinary backgrounds spans the full gamut of traditional art, science and technology domains. Through participant observation of the design process in email archives, we have noted that one of the ways in which this occurs is through the invention of terms, often unexpected and metaphorical, that become the basis of a unique shared project language. In this way text is used as a medium for direct

communication, community building and generating essential conceptual resonance within the group.

The internet provides new opportunities for tools and virtual environments in which to undertake and record collective design space exploration and design development. Virtual design studios were already being established in the late 1980s (Achten, 2002.) However there is still the need for tools or methods that more successfully achieve two, potentially conflicting, goals simultaneously. Firstly they should collect, sort and selectively make available to all, or to sub groups of the participants, the record of the design communication, including the meanings of the terms that have been used in the process and the reasons and underlying complexities of following particular paths. In other words they should support knowledge management for what is essentially a complex process. Secondly they must still provide for the spontaneity and means of expression that allow the poetic image to prosper, propagate and for communication to occur in vital ways.

2. Communication Tools and Environments for Collaborative Design

Email has been adopted rapidly in the preceding decade as a universal medium of asynchronous exchange. Through its intensive use for communication and sharing and exchange of files of all kinds it can become a de facto project repository. In this role it has very apparent and serious shortcomings. In multilateral working, there is no complete archive of communication, only a set of overlapping individual archives. Despite the construction of email lists, much of the communication is still targeted and there will be many sub conversations that are not sent to the list. Often an email will arrive through a third party as a reply or forward in which the recipient has been included while they were not included in the distribution of the earlier missive. This unpredictable and often uncharted routing graph for email can impact in quite serious ways on the process and quality of communication, collaboration, and access of the participants to the sum of information influencing each design decision and hence on the design itself.

2.1. SHARED ENVIRONMENTS: OVERVIEW

Since the term collaborative design appeared in tandem with the virtual design studio over a decade ago, increasingly sophisticated systems and tools to support it have been present in research and teaching. Achten (2002) examines the history of Computer Supported Cooperative Work (CSCW) environments and their application in architectural design to address the ongoing question of how the process can be improved such that collaborative working emerges from it. He develops an outline of a collaborative environment based on a summary from the first Euro workshop (Accolade) in Brussels, listing requirements for aspects of its performance

that encompass both the technical and the social. The design environment should resemble more a medium than a tool. Communication should be multi-modal with quick and easy data exchange between modes. Human to human interaction (HHI) should be more central than human computer interaction (HCI). A sense of presence of other participants is important. Knowledge management should be developed for wicked problems.

2.1.1. Knowledge capture

Ju et al. (2004) note that collaboration occurs in both structured and unstructured meetings and knowledge capture and reuse over the multiple iterations of the process of collaborative design needs to encompass many modes and occur essentially in the background. From outside the architectural domain, 'decentralized informal knowledge management' for the storage and reuse of snippets (Cayzer, 2004) confronts one aspect of this. Capturing information nuggets in different formats without the formal process of a centralized database has been achieved in a prototypical tool by combining the ease of publication of the web log with the power to represent and export metadata of the semantic web.

2.1.2. Messaging and chat

Instant messaging (IM) is a versatile synchronous communication tool for bilateral or small group communication and collaborative working. Application sharing, sketch tools, web camera and sound enhance the sense of presence. In addition, the opportunity to search or copy and convert the log of communication history provides means of implicit capture. Empirical study of Group Chat in workplaces shows that this is productive, less intrusive, and less affected by off topic communication and flaming than IM or other more private person to person media (Handel and Herbsleb, 2002).

2.1.3. CAAD team work and PLM

CAAD team work tools that allow locking of parts of a shared model for changing, checking, and publishing back to storage are helpful in conflict identification and resolution (Aish, 2000) but essentially facilitate cooperative rather than collaborative working, interrupting the natural flow of conversation between participants. The development of product lifecycle management tools or tools to support a managed environment for AEC IT are beginning to impact on at least some aspects of distributed design practice. However despite a significant history of design research writing producing maps and procedures for the design process, management change is still more apparent in the construction phase than in design (Austin et al., 2001).

2.1.4. *Virtual presence*

A range of prototypes have been created for tools to enhance the sense of presence in shared environments for design collaboration including full virtual reality. Interestingly while the availability of bandwidth is a primary focus for the success of virtual design studios (Burry et al., 2003), it appears that the amount of realism of participant representation, for which high bandwidth is required, is, in the end, secondary to the content that is being communicated (Vásques de Velasco and Hutchinson).

2.2. WIKI AND DESIGN

Wiki, like email, is an example of asynchronous, online, text-based communication. It has been dubbed by its creator Ward Cunningham “The simplest online database that could possibly work”. A wiki hypertext is typically accessible and editable by all. It is unusual in that not only is the content editable but the formatting and structure is also open to re-factoring. It supports hyperlinks and page creation through observation of the simple page naming convention of double capitalisation in a word or concatenation of capitalised words. Wiki’s strength is in participation. It is constructed through interaction by a community for that community. It can be a conversation and a shared document; one that has much greater potential for crafting and design than either email or web based threaded discussion lists.

Early prototypical experiments introducing wiki to academic and professional design groups have provided useful insights into the range of ways in which the medium is used. They have exposed the obvious strengths as well as shortcomings and ways in which the latter might be addressed to hone a more refined and more ontologically-directed environment to support collaborative design. Wiki inherently overcomes some of the difficulties of email. It is a shared space and it is at least partially structured by the use of terms through the creation of wiki names and their associated pages. It also overcomes the rigid rule bound character of mailing lists where postings appear in temporal order and there is an understanding that discussion must stay on topic or start a new thread. Finally it provides an environment, the organisation and presentation of which can potentially be designed or customised by any participant. However it does not necessarily provide private or small group “sheltered” space in which to incubate or workshop ideas prior to sharing work with the whole group. In early experiments this has been found to be a potential inhibitor to use. Individuals will either work outside the wiki on early ideas, or seek private wikis recreating some of the complexity and discretisation observed with email as well as an increased administrative load. Group formation and access rights management are important factors in the success of shared workspaces to support emergent group work (Burrow, 2004; Haake et al., 2004).

While wiki is inherently adapted to an approach of project language building through the conscious creation of wiki names in order to create new related pages,

its high degree of democratisation can lead to parallel development of very similar names and concepts in distant parts of the document, (distance measured in terms of links). While each wikiname must be unique and precise duplicates are recognised and excluded, similes and parallels are not. The extension of this recognition to ontologically similar as well as identical names would be a very powerful tool. It would reduce redundancy and facilitate a better structure for the hypertext. More sophisticated search tools and different ways of viewing the structure of the hypertext would also empower the navigator.

3. Primary research: email archive observation

Secondary research already provides many general criteria for the performance of systems to support or even engender collaboration based on lessons from earlier prototypes and experience with collaborative environments. We undertook primary research to select and refine appropriate performance criteria for this webbased asynchronous text-based communication tool. For this, we examined the history of a real world collaborative design project that involves a globally distributed team from diverse disciplinary backgrounds. It was a challenging project with novel objectives and unusual parameters, which appeared to command more of the team collectively than would have been achieved by the individual designers working cooperatively. The outcome was to be a large interactive wall surface that would respond in real time through movement triggered by any of a number of sensors (Goulthorpe, 2000).

3.1. PARTICIPANT OBSERVATION

Within the research team we had close participatory knowledge of this project. An email archive covering the full time period and scope of the project, although not all the communication, was available to us. However our point of departure was that no objective empirical analysis was possible or appropriate. The archive could never be considered as a complete history for numerical or objective analysis of content, language and routing of communication. We took a participant observer approach. “Critical ethnography” now “rejects the notion that we can somehow innocently write descriptions of others”. “In place of this objectivist stance, recent anthropology proposes a view of ethnography as an encounter between actors differently embedded within particular social/cultural milieus”. “This is not a problem to be overcome, it a fundamental aspect of representational work to be incorporated into our practices” (Suchman, 1995).

The approach was consciously constructionist (Crotty). The whole archive was read with particular questions in mind. Was it possible to identify discipline specific language and ontologies? Did these create communication barriers and

ambiguities? How did language and culture differences manifest and how were they overcome (Setlock et al., 2004)? How did these “lexicons” and structures of meaning, assuming their existence, build over time? Were there significant communication events, that is to say, identifiable communication difficulties or breakdowns that interrupted the collaborative process? What were the communication histories that preceded events of this kind?

These histories of significant events were written as thick descriptions, narrative recounting the events and developments recorded in the email communication with levels of inference and meaning articulated from the participant observer point of view.

3.2. FINDINGS

In brief summary, some of the findings of this exercise were as follows:

- Ontological differences between disciplines did not significantly affect the quality of communication; they appeared to act as a creative spur to the whole team to develop a descriptive project language that was both conceptually exploratory and socially inclusive and cohesive.
- Modal differences in levels of comprehension were observed between team members, the same information expressed numerically or played out in animation, for example was understood differently by some team members.
- Routing of email and tacit tree structured communication hierarchies within the team manifested as the most commonly implicated causes of breakdown of collaboration.
- Lack of communication, leaving the current state of information in an area ambiguous was also a significant problem.

3.3. MODES

Verbal and textual communication appeared to be the matrix for the design collaboration despite the fact that most of the ‘work’, i.e. implementation was being undertaken either graphically, mathematically, encoded or, in later stages through construction of prototypes. There was no access to the numerous email attachments belonging to the archive, nor transcripts or other records of the many telephone conversations and face-to-face meetings of those of the team who had the opportunity to meet. Yet the story of the collaboration unfolded quite comprehensively from the textual email archive.

4. Wiki as medium

Kvan and Gao (2004) write that text, as reflective representation, supports high level communication. Compared to voice, text can enable more reflective cognition. Sketching, conversely, is thinking (Schön, 1988) albeit a highly engaged form of thinking (Ryle). Kvan and Gao (2004, 2004) conducted an experiment comparing communication between paired postgraduate students engaged in a wicked design problem in three settings (two collocated and the third remote) and obtained results that suggested that chat-line communication supported by text with digital sketching can foster more reflective cognition and high quality design performance than face-to-face working with voice and paper.

While wiki has been consistently described as ‘text-based’, subjective observation of the use of the “simple” wikis already introduced (for academic courses, sharing work across the postgraduate community, undertaking academic research in collaboration with practice and for research collaborations within the university) shows them used in widely differing ways by the different individuals and communities. Within these design community wikis there are series of linked pages that are almost entirely graphical, and most pages combine graphics and images with text. There are pages that resemble a mailing list or chat room with a series of brief, near synchronous exchanges, messages or images and others that present as crafted documents, lengthy composed prose put up for editing and comment by others.

4.1. INTERFACE

The simple wiki page interface conforms to a designed template. However anomalies can manifest in different browsers or locations. User groups can easily undertake minor customisation but changes can be difficult to implement and harder to reverse. A leading priority in implementing an enhanced wiki environment for testing in design collaboration has been to develop a cascading style sheet template for the interface. This will give designers much greater scope to design their own project-, personal- or group- environment within the wiki.

One current bar to entry and ease of use by the whole literate community is the need to use structured text in an editor that does not resemble the formatted document. While this is no impediment to using wiki pages for unformatted messaging, it can be a source of frustration and a significant decelerator to those only used to formatting documents in word processing software. To address this and keep the constituency as wide as possible, What-You-See-Is-What-You-Get (WYSIWYG) page editing software is being integrated to make the interface nearly indistinguishable from a word processing environment. This will also introduce such functionality as undo.

4.2. LATTICE STRUCTURED ACCESS RULES

Noted above and confirmed by the participant observation of the email archive, social organisation and patterns of access to other collaborators and particular information appear to be one of the most significant factors in successful collaboration. The detailed specification of the proposal for a progressive publishing model for the wiki, resembling at a glance a self organising system is already published (Burrow, 2004). It encompasses both the dynamic formation of interest groups within the wiki community, the dynamic formation of groups of documents and measured progression of documents into a more public arena through simple means of offering and requesting access to documents. Applying lattice theory it avoids the tree structures and potential cul de sacs observed in the email archive.

4.3. COMMENTS AND ATTACHMENTS

There is already a commenting system in wiki which can be useful in supplying responsive commentary or casual foot notes. In some instances, it has been shown to illicit response where there would have been reluctance to edit the page as a whole. However, comments and attached files are currently appended to the document. While this is workable on brief pages with little content, or those pages undergoing extensive editing, the sense in which these appendices damage stable and well crafted pages dissuades participants from contributing. Furthermore, longer running pages with extensive and possibly diverse content and comments become hard to follow and related items difficult to associate. To address this, a threaded comment system has been introduced while attachments will appear in a side panel associated with the preceding content. These additions bring with them conventions of web logging and file stores diversifying the type of writing acts supported by the wiki.

4.4. ONTOLOGY MANAGEMENT

Ontology management through the web (TTW) is being used to grow an ontology over the pages, a dynamic classification system in which documents attract collections of classification tags, akin to meta data, acts to model the lifetime of documents as an alternative to a prescriptive work flow system. This lifetime modelling informs an automated archiving or version control system, backgrounding documents that either have an implied period of obsolescence, have been superseded or simply not accessed or edited for a period.

4.5. SECONDARY ENHANCEMENTS

Some other planned enhancements to be trialled are listed below.

- Publish notification of changes through both email and side panels in the wiki for events arising from changes to access rules or transitions in the classification of a document. The system determines the pertinent changes for a participant according to the current access rules.
- Visualise access rule changes and ontology changes against a timeline. The mapping between successive structures is represented by graphical marks in the style of Chi et al. (1998).
- Automate the search for target wiki pages during linking. Replace the current system in which the anchor text and the target of the link are identical, with a dictionary (or thesaurus) based search from the selected anchor text on to a selection of suitable target wiki pages. This increases the likelihood that wiki pages are reused, and participants interact on the co-creation.
- Extend the structured editing of wiki content to include metadata fields, thus introducing editing tools for a through the web ontology management system. This allows users to extend the distinctions made in the lifetime of documents to support new processes.

5. Methods of testing

5.1. REPLAY

While the first stage enhanced wiki is still being implemented, the proposals are being tested by replaying the thick descriptions of event histories from the email archive through the wiki. The communications and scenarios are recreated firstly within the simple wiki, then, decisions and assumptions are added for how the scenario would be changed by implementing, for instance, the access system, or the interface, or editing environment, etc. In effect, this is the Sims testing approach in which the player(s) (researchers) are omnipotent but conscientious in assessing the likely responses and behaviours of the character(s) (collaborative designers). Once again it provides no hard empirical results but undertaking the exercise provides useful insights into not only the relative value of substituting wiki for email but the likely weighting on various wiki performance enhancements proposed in response to the earlier archive observations. It also provides a “control” and basis of comparison that will not be possible in longterm live testing of the enhanced wiki.

5.2. PILOT

The first pilot will be tested live, firstly in the academic environment and secondly in ongoing research collaborations with practice. At this stage it is planned to evaluate it subjectively through ongoing participant observation and, most importantly, user feedback. However it could be interesting to design a controlled experiment involving

a short time-frame “play off” between different means of communication for a collaborative activity based on the Kvan Gao (2004) model.

6. Conclusions

In researching appropriate approaches to creating environments that support design collaboration it is important to keep ethnographic observation sharply in focus. Human collaboration is a social activity that feeds on novelty in communication as well as sharing ideas and content. Neither distance nor computer support need impede collaboration. Potentially textual and other non verbal representation can promote a more reflective approach to communicating. The qualities of the communication environment are important but possibly more for the evidence of human intellect and spirit within it and its capacity to capture and manage knowledge effectively and unobtrusively, than for its range of media or close mimicry of physical shared space. The purpose of communication for collaborative design may be more than simply to convey knowledge or information. Particularly at the conceptual stage of design, it is part of the creative process. The poetic is important and in this sense it is not just the intended content of communication but the tenor and open-ended transformative potential to provoke and stimulate that is significant. Social organisation, articulated in the proposal as the structure of access, is arguably the most significant key to productive large group interaction.

While wiki is not anticipated to provide the basis of the silver bullet of design collaboration, democracy and social organization have been at the centre of its creation. It does address or, in some instances, potentially address (as this is work in progress) many of the social organisational deficits in other text-based asynchronous communication systems. It is not seen as a replacement for many of the other tools already either in common use or being prototyped and tested in academic settings. It can be used ‘in partnership’ with real time web-based communication tools, and even provide a unified interface and portal to other applications in the manner of any web page.

Acknowledgements

This paper reports on original research that has been supported by the Australian Research Council. The project was initiated by and has received substantial direction from Prof Robert Woodbury, Simon Fraser University, Canada, Prof Mark Burry RMIT University Australia and Assoc. Prof Robert Amor, University of Auckland, New Zealand.

References

- Achten, H.H. 2002, Requirements for Collaborative Design in Architecture, in Timmermans, Harry (Ed.), *Sixth Design and Decision Support Systems in Architecture and Urban Planning - Part one: Architecture Proceedings*, Avegoor, the Netherlands, pp. 1–13
- Aish, R. 2000, Collaborative design using long transactions and ‘change merge’, *Promise and Reality – Proceedings of the 18th International Conference on Education in Computer Aided Architectural Design*, Weimar, pp. 107–111.
- Austin, S., Steele, J., Macmillan, S., Kirby, P., & Spence, R. 2001, Mapping the conceptual design activity of interdisciplinary teams, *Design Studies*, vol. 22, no. 3, pp. 211–232.
- Bachelard, G. 1964, *The Poetics of Space*, first published as *La poétique de l'espace*, Presses Universitaires de France, 1958, in translation The Orion Press, 1964, p. xii.
- Burrow, A.L. 2004, Negotiating Access within Wiki, in *Fifteenth ACM Conference on Hypertext and Hypermedia*, UCL, USA.
- Burry, J., Maher, A., Taylor, M. & Burry, M. 2003, Educational experiments in design project sublimation, in *The second International Conference of the Association of Architecture Schools of Australasia*, Melbourne University, Australia.
- Cayzer, S. 2004, Semantic Blogging and Decentralized Knowledge Management: Tapping in to the structured metadata in snippets of information gives communities of interest effective access to their collective knowledge, in *Communications of the ACM*, vol. 47, no. 12, pp. 47–52.
- Chi, E., Pitkow, J., Mackinlay, J., Pirolli, P., Gossweiler, R. & Card, S. 1998, Visualizing the Evolution of Web Ecologies, in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, Los Angeles, USA, pp. 400–407.
- Deshpande, N., deVries, B., van Leeuwen, J.P. 2004, Collocated, Multi-disciplinary, Collaborative Designspace, An overview, in van Leeuwen, J.P., Timmermans, H. (Ed.), *Developments in Design and Decision Support Systems in Architecture and Urban Planning*, Eindhoven: Eindhoven University of Technology, ISBN 90-6814-155-4, pp.253–268.
- Goulthorpe, M. 2000, *Decoi Aegis-Hyposurface in Stephen Perrella (Guest ed) Architectural Design Hypersurface Architecture II* London Wiley.
- Haake, J.M., Haake, A., Schummer, T., Bourimi, M. & Landgraf, B. 2004, End-User Controlled Group Formation and Access Rights Management in a Shared Workspace System, in *Proceedings of the ACM conference on Computer Supported Cooperative Work*, Chicago, Illinois, USA, vol. 6, no. 3 pp. 554–563.
- Handel, M., Herbsleb, J.D. 2002, What is Chat Doing in the Workplace? In *Proceedings of the ACM conference on Computer Supported Cooperative Work*, New Orleans, Louisiana, USA, 1-58113-560-2/02/0011.
- Ju, W., Ionescu, A., Neeley, L. & Winograd, T. 2004, Where the Wild things Work: Capturing shared Physical Design Workspaces, in *Proceedings of the ACM conference on Computer Supported Cooperative Work*, Chicago, Illinois, USA, vol. 6, no. 3, pp. 533–541.
- Kvan, T. & Gao, S. 2004, Frames, Knowledge and Media: An Investigative Study of Frame Systems within Computer and Paper Supported Collaborative Design Process.
- Kvan, T. and Gao, S. 2004, Problem framing in multiple settings , H. S. Lee and J. W. Choi (eds) *Ninth International Conference on Computer Aided Architectural Design Research in Asia (CAADRIA)*, CAADRIA, Yonsei University, Seoul, Korea, pp. 453–466.
- Schön, D.A. 1988, *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass.
- Setlock, L.D., Fussell, S.R. & Neuwirth, C. 2004, Taking It Out of Context: Collaborating within and across Cultures in Face-to-Face Settings and via Instant Messaging, in *Proceedings of the ACM conference on Computer Supported Cooperative Work*, Chicago, Illinois, USA, vol. 6, no. 3, pp. 604–612.

- Spence, R., Macmillan, S. & Kirby P. eds., *Interdisciplinary Design in Practice*, London, Thomas Telford, 2001.
- Suchman, L.1995, Making Work Visible, in *Communications of the ACM*, vol. 58, no. 9, pp. 56–61.

