

## Mapping Process: Diagrammatising Social Software Use and Knowledge Creation

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**ABSTRACT** This work investigates means of visualizing our past histories in relation to social software to better understand these online spaces, the inter-relationships they create and how we produce and document knowledge.

Continual developments have made it incredibly easy to interact with social software technologies, but in systems where we only see the latest iteration of a page what happens to the previous conversations and interactions? These contributions, sometimes accumulated over years and by hundreds of participants, are what makes these systems unique, and it is this process of contribution, negotiation, discussion and debate that is often hidden from us. What is unseen is arguably the most important and interesting part of this paradigm shift.

Missing is the opportunity to better understand and take advantage of these previous conversations and interactions—the steps that evidence how we got to here, the negotiations that took place, the deletions, and the refinement. This paper posits that by diagrammatizing this knowledge accretion process in social software systems, particularly in wikis, we can better understand our online social spaces, the inter-relationships they create and how we produce and document knowledge. I set out and re-examine the current dominant wiki models; I then classify, describe and explore two categories of wiki visualization artefacts, categories driven by the relationship between the contributor(s), the technologies and the wiki's purpose. In each category I present prototypes—designed artefacts—to communicate the benefits of diagrammatizing these past conversations and interactions.

**INTRODUCTION** “I leave to the various futures (not to all) my garden of forking paths.”<sup>1</sup>

Social software has allowed us to question, challenge and change many of our existing practices, from: how we socialize (Facebook); how we promote ourselves, products and acts (MySpace); to how we accumulate and document knowledge (Wikipedia). While many of these forms of interaction, often dubbed Web 2.0 or Social Software, are innovative and are reshaping territories it is my belief that the collective knowledge practice of wikis is the most interesting and radical. Pooling together knowledge accretion, the mass intellect and the self-correcting practices of the collective are all new territories for how we document and validate information and knowledge.

Continual developments have made it incredibly easy to interact with these technologies, but in systems where we only see the latest iteration of a page what happens to the previous conversations and interactions? These contributions, sometimes accumulated over years and by hundreds of participants, are the very thing that makes these systems unique, and it is this process of contribution, consideration, discussion and debate that is often hidden from us. As Viégas notes, the archives of these exchanges are “usually cumbersome, impenetrable records of the past.”<sup>2</sup> What is unseen by the viewer is arguably the most important and interesting part of this paradigm shift.

Missing to the viewer and the contributor is the opportunity to better understand and take advantage of these previous conversations and interactions—the steps that evidence how we got to here, the negotiations that took place, the deletions, and the refinement.

This paper posits that by diagrammatizing this knowledge accretion process in social software systems, particularly in wikis, we can better understand our online social spaces, the inter-relationships they create and how we produce and document knowledge. I will set out and re-examine the current dominant wiki models; I will then classify, describe and explore two categories of wiki visualization artefacts, these categories are driven by the relationship between the contributor(s), the technologies and the purpose of using the wiki. In each category I shall present prototypes—designed artefacts—to help communicate the benefits of diagrammatizing these past conversations and interactions.

By visualizing and making accessible these interactions and histories these artefacts cause us to question current technologies and systems but also puts forth new designs that test and improve the existing scenarios, rendering that which is currently hidden into “something that is within our reach, something visible and tangible.”<sup>3</sup>

To investigate and clarify this territory this paper draws upon Kaptellin and Nardi's writings on activity theory and the role it plays in relation to interaction design, additionally it references Ruecker's work in developing a system he refers to as rich-prospect browsing.

#### METHODOLOGICAL FRAMEWORK

This paper's methodological framework involves the examination and critique of the current prevailing practice in how we view and interact with wikis. It explores a re-examination of these practices by proposing new and alternative ways of accessing the past activities of users' through design prototypes. The prototypes are offered as an alternative to the current practices in addition to serving as a critique of the current paradigm.

These prototypes are not fully resolved answers that are meant to completely replace the existing practices, nor are they fully realized and rationalized solutions; in this instance they are not a design solution to resolve one specific problem. Rather than solving a problem, they allow us to question existing prominent practice and explore possible alternatives.

#### THE CURRENT SCENARIO:

##### SOCIAL SOFTWARE AND WIKIS

The English edition of Wikipedia took over 5 years from its launch in January of 2001 to amass over one million articles. It has taken a little under one and half years for it to add another million—surpassing the two million mark in August of 2007. Since its launch, Wikipedia, by far the most popular of wikis, has helped to drastically change our relationship with information, altering not only how we locate it but also how we produce and document it.<sup>4</sup>

It is this opening up of information production and documentation that is truly paradigm shifting. Where once the creation, documentation and dissemination of information was a highly controlled enterprise that was the realm of the elite few, wikis generally allow anyone to add to their vast archive of information. As Rosenzweig notes "A historical work without owners and with multiple, anonymous authors is thus almost unimaginable in our professional culture."<sup>5</sup>

Wikis have been at the forefront, along with other systems like Facebook, MySpace and Youtube, in altering our relationship with information. Commonly dubbed Web 2.0 or Social Software these technologies allow people to share information, to "build a new kind of international understanding, not politician to politician, great man to great man, but citizen to citizen, person to person."<sup>6</sup> At

their heart all these technologies are about communities—building and enabling them in addition to recognizing that the knowledge of the many outweighs that of the individual and that "those who use it are also those who create it."<sup>7</sup>

While these technologies have continued to develop, becoming an important communication model, many other possible features are under-developed. While it is incredibly easy to interact with and contribute to wiki systems it is much more difficult to access past contributions, track dialogue or gain an overview of the community's interactions, and without access to this sort of information it is challenging to understand the larger context of these interactions and relationships. As Fry notes, "few techniques exist for visualization of data whose structure and content are continually changing."<sup>8</sup>

The data continues to accumulate, and the interactions multiply as these systems continue to grow in popularity. The increasing role they play in information creation and dissemination makes it even more important that we have tools to help us make sense of the ever-increasing dialogue, tools to help us visualize, analyze and understand.

In this first section I shall explore the role that closed wiki systems play, explaining the current scenario and then through the presentation of a designed artefact present new possibilities while questioning the existing practice.

#### DEFINITIONS

For the purpose of this paper the following definitions shall be used:

- *Wiki*—is a collaborative website that can be edited by any of its users, blurring the barrier between writer and reader.
- *Wikipedia*—is the largest and most well known example of a wiki. Wikipedia describes itself as a "multilingual, web-based, free content encyclopedia project. Wikipedia is written collaboratively by volunteers from all around the world."<sup>9</sup>
- *TikiWiki*—Is an open source, multi-lingual wiki-based Content Management System that is popular with developers and education providers. Instead of single articles or pages, as you would find on Wikipedia it also allows the building of complete sites that the owner and users has more control over.

- *Pages*—The current wiki page represents the final edition of a specific wiki subject, this page is the result of all the previous editions before it.
- *Editions*—Individual entries or edits of a wiki page contributed by a single user. A page may be composed of tens, hundreds or thousands of editions (i.e. the Wikipedia page for Goldsmiths (University of London) contains 519 editions—or past edits as of 01/12/08).
- *GD:NM*—Graphic Design: New Media, a subject area that specifically looks at technologically-enabled rich media communication. I ran a BA(Hons) GD:NM course and the following research and designed artefacts were created around a wiki from this course.

#### CLOSED SYSTEMS: WIKI VISUALIZATION OPPORTUNITIES FOR PEDAGOGY

Closed Wiki systems are those that are either limited in their membership or subject area. Often used within education or business, closed wikis are used to explore means of collaboration and information gathering around a specific subject area or focus. The wiki may or may not be fully open to the public to read and comment on. Although the closed systems example used here is concerned with pedagogic issues the ideas and artefacts are applicable to industry as well.

Wikis represent a variety of opportunities in relation to learning, from empowering the individual to creating scenarios where learners need to explore collaboration and negotiation; additionally wikis present students with new learning environments helping to addressing different learning styles. As Grant notes in a paper for Futurelab looking at the value of wikis in education—“The diversity of communities that can form through wikis and other forms of social software can be a source of creativity and inventiveness.”<sup>10</sup>

To further explore these benefits in March of 2007 I worked with a group of my GD:NM students to create a wiki site (FIGURE 1). This system was created for a variety of reasons, including: to provide subject material to investigate how social software systems and wikis in particular can be used in pedagogic environments; as a means of helping a select group of students to better understand and elucidate what GD:NM is and can be; as source material for this research; to help me better understand the mechanics and physics of wikis. This wiki system is built on the TikiWiki platform, a popular system used in

education that is open source, robust and highly adaptable. All the visual process diagrams in this paper that refer to the GD:NM wiki represent actual data that was collected throughout this trial period.

One of the limitations of wikis is a lack of tools to visualize the interactions by and within the communities that use them. Generally there are two viewing modes: by default wikis show the latest edition of the page; additionally viewers can also compare individual entries of a page's history—but at most this allows you to look at two editions at a time and compare changes. As it is not uncommon for pages to have tens if not hundreds of edits, looking at two editions at a time offers a limited experience. Additionally in the closed wiki systems common in education, wikis might cover a topic or area and be composed of numerous pages (e.g. the GD:NM site is composed of seven distinct but relating pages). Tools to visualize these systems, where we are interested in the interactions in pages but also in between the pages are also lacking.

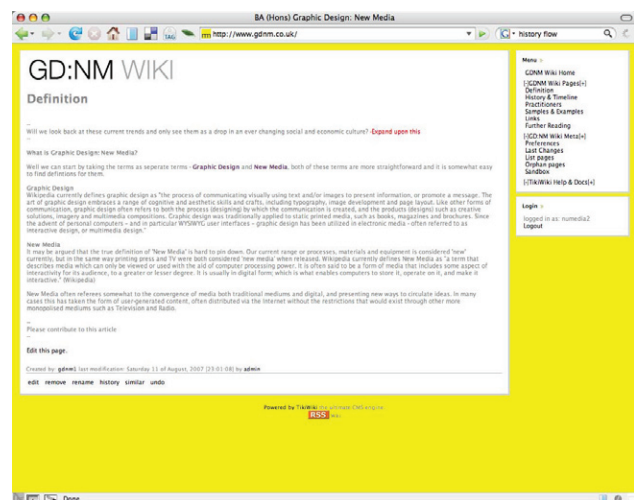
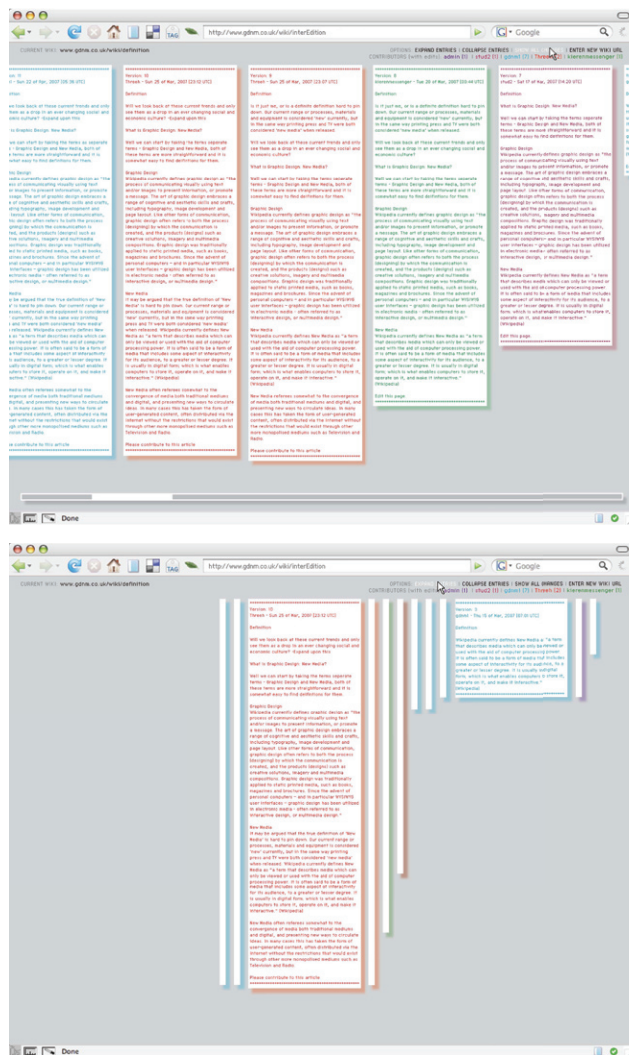


FIGURE 1

*macroViewer* (FIGURE 2–3) is design artefact that creates process diagrams that visualizes wiki systems, helping contributors to better comprehend their own role in shaping the wiki in addition to helping others gain a better understanding of the collaboration that has taken place. *macroViewer* works with both single page wikis by diagrammatizing the interactions between the editions and in larger closed wiki systems that have many pages by also visualizing the possible interactions between different pages.

To begin *macroViewer* the user enters the wiki URL that they want diagrammatized, *macroViewer* then mines the data from the wiki—whether as an individual page or

as a closed system. *macroViewer* reads all the pages and edits associated with the wiki and lists this information on the right hand panel—with titles of pages and number of edits in parenthesis after. *macroViewer* then pulls all the information for each page from the database that it is stored in and creates a schematic for the wiki site (FIGURE 2). Each row in the schematic represents a single wiki page, while each icon in the row represents one edition for that wiki page (i.e. If a row has 3 1 page icons then it has been edited 3 1 times). The size of the icon represents the amount of text in that edition (the longest icon on screen contains the most text). *macroViewer* automatically adjusts the spacing of these icons to reflect the number of entries, for pages or sites with hundreds of edits the diagram becomes scrollable.



FIGURES 2 and 3

Each contributor to the site is listed in the floating legend on the bottom left, with their number of edits in brackets after their name and a color assigned to them. This color is then mapped to the schematic icons so the viewer can easily see the relationship between users and contributions. By rolling over the individual row editions users can see who contributed the article, when they submitted it and the beginning of the text. If the user wants to see all the text for that specific entry, clicking on the page pulls up the text into the right-hand column, within the text the contributor's color highlights any of their additions, edits or deletions (FIGURE 3).

*macroViewer* offers numerous benefits, from both a general usability sense and from a pedagogic viewpoint. In the first instance we can now see a diagram of all the contributions to a wiki, whether one page or a full site, and this communicates to the viewer a wealth of information about the wiki's history and the interactions between the contributors. Where once this information was invisible, or at least difficult to access, it is now "within our reach, something visible and tangible."<sup>11</sup> In addition this visualization of the process allows different types of learners to access the information; before the information was purely textual and fragmented, it is now also diagrammatical creating a more robust representation of the proceedings. Secondly these diagrams make it much easier for contributors to recognise and map their own contributions to a wiki in relation to the whole, enabling users a "personalized learning experience while also experiencing learning as part of a community through collaborating with others in shared activities."<sup>12</sup> By recognizing their own work in relation to the collective whole, participants have another means to help them better comprehend their own activities, and this information can help students become more proactive in their learning. Importantly the visualization also allows others to view the contributions, when used in a pedagogic situation this makes an invaluable tool for the teacher to better understand the contributions and interactions amongst students.

*macroViewer* allows the viewer and the contributor new ways of looking at and interacting with wikis, facilitating access to new forms of information and re-interpreting existing ones making the experience more informative, robust and effective. In addition to providing new information *macroViewer* also allows us new opportunities to reflect on our interactions and relationship with wikis. As Gilford and Enyedy note "There has been a growing realization that to have a positive impact on education, technologies should be designed to support purposeful actions of the human actors involved in everyday educa-



tional practices.”<sup>13</sup> *macroViewer* creates a more purposeful and communicative environment to assist the user in understanding their actions, the actions of others and the relationships developed within this collaborative system’s community.

While designing interaction systems that dealt with large data sets Ruecker developed his criteria for what he terms rich-prospect browsing. These criteria served as both a codification of needed qualities and as a benchmark to test new interface designs. The needed criteria focused upon two main points: that the viewer must have access to all the data and that the user must be able to manipulate the data to suit their own needs. *macroViewer* has been designed with these guidelines in mind, and users benefit in two key areas in comparison to existing systems: an increase in the kinds and amount of information that is present and visible, and “new opportunities for action that derive from tools associated with the display.”<sup>14</sup> It is easier for users to make sense of the wealth of information presented and to act upon it to gain further insight and understanding.

In addition to exploring how we can enhance our interactions within closed wiki systems in pedagogic situations I also look at how we can develop more effective open systems.

#### OPEN SYSTEMS:

##### DIAGRAMMATIZING WIKIPEDIA INTERACTIONS

Open wiki systems are those that are open to be both read and to contribute to, where individuals come together to collaborate and create a codified piece of knowledge. There are very few if any limitations or a requirement to register (e.g. on Wikipedia entries by unregistered users are tracked by recording the IP address of the user’s machine). Open wiki systems are just that—there is not any overarching structure and each page exists as a separate entity that then can be linked to other external pages—either in the same wiki or outside of it.

The most popular example of an open wiki system is Wikipedia, which functions as an online collaborative encyclopaedia. Contributors create individual pages that focus on a specific subject of their choosing, they and others can then add to, edit, delete and re-categorise these pages. Depending upon the popularity and topicality of the subject a page may receive few contributions (the interactive collective Antiom’s entry has just 30 editions posted over the page’s existence) or a great many (George W. Bush’s entry has received 588 edits in the period between 01/07/2008 to 31/09/2008).

Open wikis have created a paradigm-shift in relation to knowledge creation and documentation, democratizing the process of how we contribute to and understand information. In November 2008, Alexa traffic ratings reported that Wikipedia was ranked number eight of the most visited websites in the world, above both the BBC (at number 46) and the Encyclopaedia Britannica (at number 2509)—both more traditional information and reference providers.<sup>15, 16</sup>

It is obvious that wikis have moved into the mainstream, the technology is sufficiently robust and developed to allow users to easily partake and contribute to these communities. What is now needed are tools to visualize and to help analyze these interactions. In their writings Kaptelin and Nardi discuss the valuable role that activity theory can play in relation to interaction design, they note “it is the doing of the activity in a rich social matrix of people and artefacts that grounds analysis.”<sup>17</sup> The current situation provides this matrix of people but what is lacking are the fully developed artefacts—the means to instigate and facilitate this analysis. As they go on to later note “We cannot merely relate accounts of endless detail with no summarizing, shaping, transforming tools at hand. We need the power to compare, abstract, and generalize.”<sup>18</sup>

*wikiVisualiser* (FIGURE 4–6) is a visualization artefact that is designed to help contributors and the online community better understand, compare and analyze the historical contributions of a single page. As discussed earlier the built-in visualization tools for analyzing the past histories on a wiki page are limited, you can view individual entries that are contained in the past edits, or compare two edits at a time. Even for smaller, less popular (or contentious) pages, like the Antiom site (with its 30 editions), it becomes very difficult to gain an overall sense of the interactions and the community, let alone abstract and analyze, as Nardi and Kaptelin would like us to.

It is this area of comparison that *wikiVisualiser* addresses. *wikiVisualiser* works by diagrammatizing the editions of a wiki, it does this by data-mining the key information from the entered URL. *wikiVisualiser* then represents the information on screen through a series of bar icons, each icon represents a single edition of the page with the height representing the amount of text in each entry. Contributors to the page are listed in the top right hand corner with the number of posts they have submitted in parenthesis after, each contributor is also assigned a color and this is then linked to their icons. In the example contained in this paper, which uses data from the GD:NM wiki definition page, we can see that there has been 12 posts to date from five contributors (FIGURE 4).

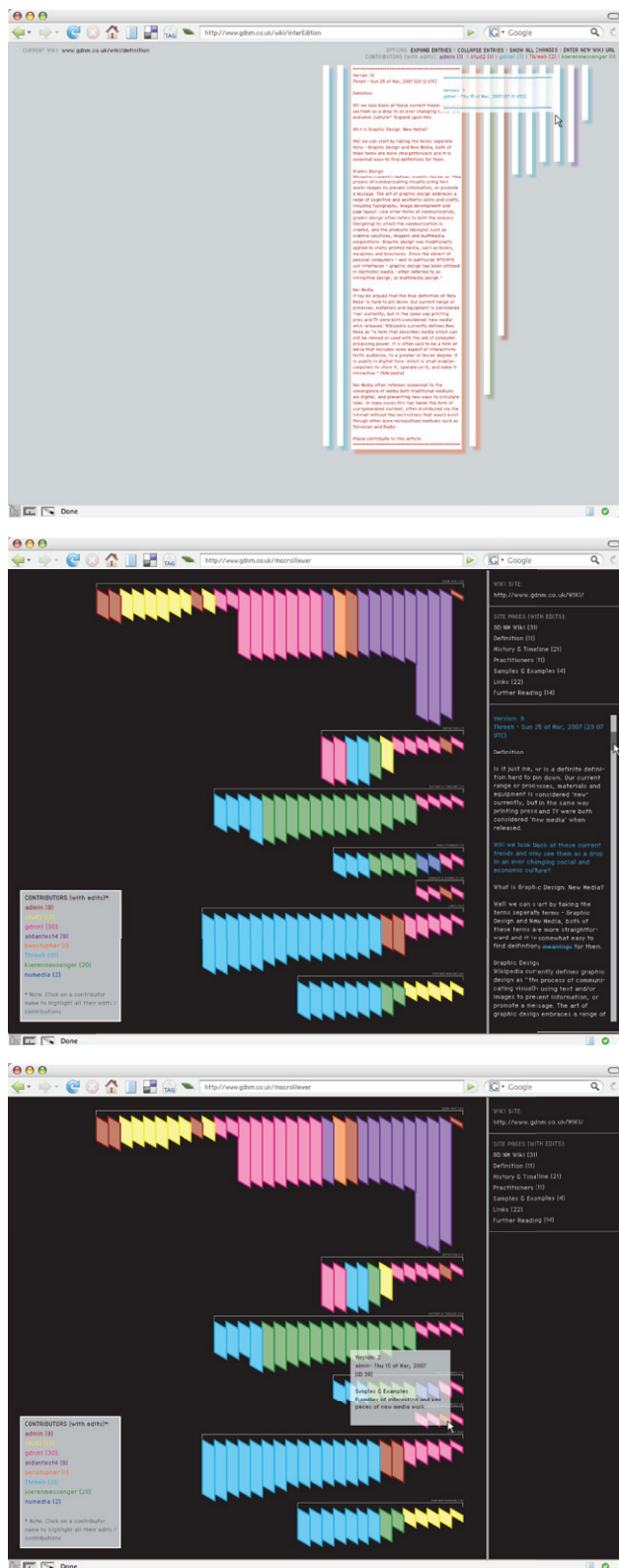


FIGURE 4-6

When the cursor rolls over an icon the version number, name of the contributor and date of contribution are highlighted, giving the viewer a summary of the information. When the user clicks on one of the icons it expands to show the full entry. In this method the user can choose which and how many of the entries to expand, read and analyze (FIGURE 5). They can also choose to expand all the entries (FIGURE 6) or expand the entries of a single contributor by clicking on the contributor's name in the upper right hand corner (if needed the screen becomes scrollable to allow access to all the entries). Viewers can also choose to highlight the changes to an entry to locate the additions, deletions and edits enacted by the contributor—highlighting these in black.

By altering our current interactions with technology and information *wikiVisualiser* creates greater opportunities for users to gain insight into the relationships between wikis and the people that use them. This tool enables analysis and comparison, allowing the user to visualize and track the proceedings of an entry and importantly to recognise the inter-relationships between the information and the user and between different contributors. By clearly identifying who is posting what and when we can better recognise patterns and abstractions to further understanding these interactions leading to activity theory's call for more "purposeful, mediated, human social activities."<sup>19</sup>

Hallnas and Redstrom argue that computational artefacts need to move from being wholly concerned with efficient use to having a meaningful presence,<sup>20</sup> the opportunities provided by *wikiVisualiser* helps us to move towards this.

## CONCLUSION

This paper has explored means of how we can re-examine our interactions with online social spaces and in particular wikis. To do this it has defined different scenarios of wiki use; it has then critiqued these systems and juxtaposed alternative design proposals that allow new opportunities for comprehension and analysis. It has drawn in Kaptelin and Nardi's work on applying activity theory to interaction design and also pulls in Ruecker's criteria for designing rich-prospect browsing systems as means to evaluate the proposed artefacts.

Both of the prototypes presented drew on the value of using diagrams and visualizations as a tool to help communicate and make sense of large data sets. As Abrams and Hall note, diagrammatizing information has emerged in the information age as a "means to make the complex accessible, the hidden visible, the unmappable mappable."<sup>21</sup> The value of these image-based systems was found

in not only how they revealed and represented the existing data but more importantly in how they facilitated the identification of the relationships between the contributors, the information and the technologies involved.

As social software systems continue to grow in popularity and prominence, and as the archives of correspondence and conversation continue to compile it is hoped that our means of understanding the relationships that are built in these environments can also be expanded. The artefacts and prototypes presented within this paper are not fully realized and rationalized solutions; instead they are starting points, providing opportunities for discussion and debate about the types of tools we need to better understand these online social spaces, the inter-relationships they create and how we produce and document knowledge. Ultimately the goal of these artefacts is less concerned with the design structure itself, but “the opportunities for action that such a visual structure might provide.”<sup>22</sup>

#### BIOGRAPHY

Aidan Rowe's research and practice interests are in design and education. Recent practice-based work explores human computer interaction, net.art, and information aesthetics. Written and pedagogic work revolves around understanding and improving design education in practical and theoretical forms. He has lectured and taught design in Canada, Japan, and the UK.

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