TRELLIS: A BLOG-BASED APPROACH TO THE DEVELOPMENT,

ORGANIZATION, AND VISUALIZATION OF IDEAS

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TRELLIS: A BLOG-BASED APPROACH TO THE DEVELOPMENT,

ORGANIZATION, AND VISUALIZATION OF IDEAS

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The creative process is often indirect. Ideas may come in bursts, evolve gradually, or include missteps and false turns. It is helpful to have a scaffold to maintain a history of thoughts and provide structure onto which nascent ideas can be stored and expanded. "Trellis" is a model for implementing such scaffolds, based on two maturing technologies, blogging and radial mapping. Although common methodologies for developing ideas are traditionally implemented on paper, they are particularly suited for the digital realm. Rather than re-interpreting these methods, Trellis provides a centralized, hierarchical container for the information associated with an idea, visualizes the connections between ideas, and allows the user to travel backward in time to monitor the evolution of a

project. This approach conjoins the real-world creative processes of thinking, writing, and collaborating – with a digital space for storing, collecting, and visualizing the result of an intellectual activity.

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Style Manual used:

       Department of Industrial Design

Software used:

       Adobe Photoshop
       Adobe Illustrator
       Apple Safari
       Apple iTunes
       Mac OS X Dictionary & Thesaurus
       Microsoft Word

TABLE OF CONTENTS

LIST OF FIGURES

I. INTRODUCTION

The idea development process is often difficult to predict. New knowledge can give way to new concepts, radically changing the organization or scope of the idea. Such a rapidly changing approach makes it easier to lose track of not only the process, but also any knowledge associated with the idea [24].

Often, it is up to the individual to establish an organizational structure for the development of an idea. Commonly a sketchbook or journal may be used, but this format proves cumbersome when working with a diverse palette of media [2]. Such an invariable storage medium also makes knowledge reinterpretation more difficult. This is evident when doing Internet-based research, as writing down the addresses to websites on paper proves to be less natural than saving it as a bookmark within a browser.

Static structures for the management and storage of ideas are revealing that they are incompatible with the processes and media associated with a technology-aided design process [13]. This incompatibility can manifest itself as a stumbling block in the design process, for example, in how time is wasted in the search for misplaced information. These stumbling blocks hinder the design development phase, which can account for up to 85% of the total cost of the design process [4].

Knowledge is becoming a critical asset of accelerated design development [8]. As design development moves toward a more knowledge-centric axis, systems that enable the continuous flow of information during the design process can reduce both the costs and time required for development [16]. Beyond the cost advantage, these systems form a historical design record, capable of bridging the gap between past and present design initiatives [21].

This paper investigates knowledge, surveys its usage for developing ideas, and proposes a self-sustaining model for managing the development of ideas. The proposed model employs a scaffold for managing the information encountered during the idea development process. This scaffold organizes and visualizes the process by abstracting the function of open-source web publishing software. Such an approach aids in the retention of ideas and being based on an open platform, relies upon no proprietary technology.

II. KNOWLEDGE & IDEAS

A characteristic of human behavior is the intrinsic desire to capture, sustain, and transfer knowledge. This human fascination with knowledge is clearly evident in how, as a species, we have collected and compiled a record of our growth, which we call history. Access to this history sustains the knowledge of those who have come before us, often revealing new ideas as combinations of new and pre-existing knowledge. By paying careful attention to history, one can collectively learn from both the mistakes and success of others.

2.1 Knowledge

Davenport and Prusak define knowledge as a combination of experience, ancillary information, insight, and standards that provide a foundation for assessing and assimilating new experiences and information [6]. Polanyi further identifies knowledge as existing in two forms, both tacit and explicit [23]. Tacit knowledge exists subconsciously, often without the individual being actively aware of its presence. Conversely is explicit knowledge, which exists actively and may be more easily communicated or understood. A good example of this distinction can be seen in describing how to write a song or paint a picture – the actual process, although

documentable, is difficult to simplify down to a set of instructions which will give the same result, when repeated.

Likewise, even though knowledge about designing is usually considered tacit [9], it can be externalized and embedded within its creators [6]. Even externalized, knowledge is often difficult to quantify, due to the fact that the cognitive dimension of knowledge consists of concepts, values, and mental frameworks that are established within the creators, and often taken for granted [21].

Both Court [5] and Ramesh and Tiwawna[25] recognize several classifications of knowledge that designers use in the development process:

1. **General knowledge**: Knowledge gained through day-to-day experiences and not applied to a specific domain.
2. **Domain specific knowledge**: Knowledge gained through study and experience within a domain. This is commonly proportional with experience.
3. **Procedural knowledge**: Knowledge gained from experience of undertaking a task within a domain.

Procedural knowledge usually exists in a tacit form and may contain the most valuable knowledge of the design process [5]. This knowledge may include a set of mental concepts, such as design fundamentals, criteria, specifications, or theory [25]. Being tacit knowledge, it is often difficult to

articulate, which if not transferred can create knowledge gaps within an organization [6]. Tiegland, et al [32] note that channels for leveraging procedural design knowledge are becoming increasingly important for the efficiency of a modern Internet aided design process. They continue to suggest that these channels must be effective in the capture, recycling, management, and transfer of procedural design knowledge.

2.1.1 Description

Before knowledge can be captured, it must be somehow described. Russell cites description as a set of understandings about an object [28]. Similarly, describing is the process of generating these descriptions. Description is crucial in the development of knowledge, as it serves as a foundation upon which an object can be understood. Descriptions can be simplified into individual traits. A trait is a singular distinguishable property of an object – such as color, size, or texture. Quantifiable traits can be further rendered into standardized units called data, a set of discrete, objective facts [6].

The iterative foundation of description can be understood by viewing it with a technology-based model. Just as new technology is formed from varying combinations of older technologies, description is in itself a similarly recursive process. This recursion forms descriptions that ultimately seek to describe themselves, becoming increasingly more complex with each

iteration. Such complexity can be organized by processing description with an object-oriented, recursively explained approach:

A description:	Broken into traits:	Interpreted as data:

"The phonebook is in the sunroom inside the basket with magazines."	1. The phonebook is in the sunroom.
	2. The sunroom has a basket.
	3. The phonebook is in the basket.
	4. Magazines are in the basket.
		sunroom
		{
		   basket
		   {
		      phonebook
		      magazines
		   }
		}

Table 1 - A description broken down into traits and interpreted as data.

Descriptions are a multivariate medium. This dynamic nature enables them to be rendered in different resolutions. Low-density descriptions, although compact, can be misleading. In contrast, high-density objects are well described, at the cost of storage space. Consider the figure below:

Figure 1 - The same image at different resolutions.

Although both images are the same physical size, they are rendered at different resolutions. The image on the left is difficult to discern, yet occupies only 5 kilobytes of disk space. In contrast, the image on the right is described in high density at a cost of 50 kilobytes.

A side effect of variability is misinterpretation. Just as one might describe his girlfriend as *smoking hot*, this description carries multiple meanings: either she is quite physically attractive or perhaps she is on fire and should seek medical attention immediately. The variable nature of description proves troublesome when transferring knowledge, as their interpretation can lead to false understanding [17].

2.1.2 Definition

Definitions are the formalized descriptions of an object. Having an official definition makes knowledge easier to understand by establishing rules upon which assumptions can be formed [31]. These rules enable understanding to advance at exponential rates by building upon the assumptions formed from previous knowledge.

Formalized definitions compress knowledge. Compression attempts to reduce the size of a description by grouping together similar traits [14]. The resultant group is of smaller size and simplified description. Well-formed compression techniques are keen to identify similarities within a dataset, allowing for further simplification. A good example can be found in John

Maeda's *The Laws of Simplicity* [18]. He presents the reader with the following collection of words:

```
    red lion cola pepper sapphire
    blue bear frappe salt diamond
  green alligator martini msg topaz
 pink flamingo espresso garlic ruby
  white giraffe milk cumin emerald
 black penguin beer saffron amethyst
 gray dog water cinnamon turquoise
```

Figure 2 - A collection of words

He notes that the addition of a little white space clarifies this jumbled mess of words, revealing its implied relationships:

```
red          lion        cola        pepper      sapphire
blue         bear        frappe      salt        diamond
green        alligator   martini     msg         topaz
pink         flamingo    espresso    garlic      ruby
white        giraffe     milk        cumin       emerald
black        penguin     beer        saffron     amethyst
gray         dog         water       cinnamon    turquoise
```

Figure 3 - Applying organization

Optimum compression yields the perfect balance of size to density. Nature tends to be quite good at this, obvious in the structure of Romanesco Broccoli, which uses a spiral to compress its form into a beautiful result:

8

Figure 4 - Romanesco Broccoli

2.1.3 Vocabulary

Grouped sets of definitions form vocabularies. A vocabulary is a set of definitions upon which knowledge can be formalized and interpreted [29]. The complexity of a vocabulary is dependent upon the resolution of its description. Likewise, vocabularies are necessary for describing new technology. This symbiosis sustains evolving knowledge by forming a recursive process of description and definition. As knowledge evolves, new vocabularies are formed to describe it.

The symbiotic relationship between knowledge and technology can be understood by examining the development of the field of medicine. In proportion to the understanding of the human body, medicine has been able to both cure and prevent the spread of diseases that would have ravaged past civilizations. As a body of knowledge develops, new vocabularies are produced to formalize the knowledge they describe. Such is the case with the

9

modern field of genetics budding from Mendel's study of inheritance in pea plants. Future research in genetics will continue to simplify the understanding of the human body, spawning new research and developing new vocabularies for describing its function.

2.1.4 Language

Language is a structured method of encoding knowledge for transfer. Specialized languages developed as a result of organized knowledge are called pattern languages. The idea of pattern language was first described by the architect and systems theorist Christopher Alexander and can be used to describe how formalized vocabularies can be evolved into specialized languages for increased understanding [1]. His research sought to develop a language in which architects and civil engineers could communicate with others about the intricacies of designing spaces.

Language development reflects a high level of organization applied to a specific body of knowledge. Through the application of different vocabularies, languages further compress knowledge and encode it within a streaming format for exchange. Nature offers an excellent application with DNA, a pattern language that defines the structure and function of living organisms. DNA compresses the knowledge required to build living things within a vocabulary defined by combinations of four different nucleotides. This compression forms a beautifully succinct, high-density structure:
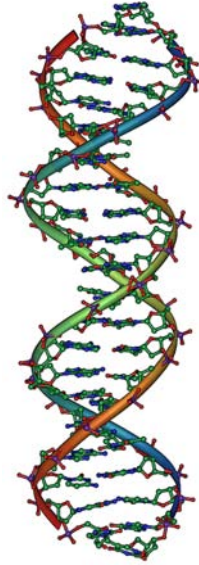
Figure 5 - DNA

2.1.5 Interface

Interfaces facilitate the transfer of knowledge. This process is delicate and tedious, as knowledge must be decompressed, interpreted, and reconstituted. Use of an interface produces experience, a historical record formed as the result of interaction [6]. Experiences are simple descriptions themselves, which can be further formalized into expected results; called expectations.

Interfaces create robust, high-density experiences that properly decompress knowledge and reveal its definition. A successful interface delegates knowledge quickly and with great accuracy, while handling unexpected events; called errors. Such errors occur when knowledge cannot be interpreted, often as a result of incomplete description or false organization. Upon encounter of the unexpected, an interface attempts to

11

render experience at reduced detail, degrading gracefully into a lower resolution.

The human body transfers description through a set of specialized interfaces; called senses. Each sense has its own language and subsequent vocabulary. For example, vision may be interpreted through languages of color, form, and balance, and taste with salty, sweet, and sour. These interfaces compress, encode, and transfer information at great speed and resolution, allowing instantaneous response to multiple stimuli.

2.2 Ideas

Not surprisingly, more attention has been placed upon systems to manage ideas and associated knowledge [7]. Dooley and O'Sullivan suggest that the growth may be attributed to recent findings that organizations that manage and develop their own ideas see more growth and better knowledge retention [7]. Despite Council's projection of development costing up to 85% of the total cost of the design process [16], Rochford maintains that the idea creation phase of design is considerably less costly in comparison with later development stages [27]. Given its lower cost and intrinsic flexibility, employing strategies for the management of developing ideas can both maximize and preserve the total creative potential of the idea creation phase.

2.2.1 Creativity

Van de Ven [33] suggests that innovation can originate from "a recombination of old ideas, a schema that challenges the present order, or a formula or unique approach that is perceived as new by the individuals involved." Innovation is a product of creativity, a process which "results in the generation of new and useful ideas or the combination of existing ideas into new and useful concepts to satisfy a need [10]." Creativity can be separated into three categories: normative creativity, exploratory creativity, and creativity by serendipity [19]. Normative creativity forms ideas to solve a fixed set of problems and objectives. The pre-defined nature of normative creativity is generally more efficient, yet it has a tendency to limit creative output.

Exploratory creativity generates a wider array of ideas. These ideas may not necessarily be related to known design requirements. It differs from normative creativity in that it does not focus on using pre-determined answers to known problems. Exploratory creativity may not always generate commercially viable ideas, yet the broad scope can sometimes uncover a broader diversity of concepts and ideas from which another solution can form [20]. Flynn, et al note how exploratory creativity is especially useful for combining current knowledge with new technology [11]. In the proper balance, exploratory and normative creativity can sustain both specification and creative freedom.

Creativity and the resulting innovation are said to take place by serendipity when the idea underlying the innovation is discovered by accident [11]. Often this occurs as a result of being involved in a problem yet at the same time sufficiently distant enough to prevent over-analysis. This immersion is regarded as being an important factor for gaining creative insight. Beyond immersion, creativity may be further affected by external and internal relationships as well as the environment in which creativity occurs [17]. Flynn, et al. agree, noting the presence of a creative culture becoming a critical component of innovation and better maximization of the creative process [11].

2.2.2 Creative Process

The creative process calls upon the collection and organization of knowledge into a mental model, which can then be used to develop new ideas. James Webb Young identifies the creative process as a five-stage process [35]:

1. Gathering of raw materials
2. Order and analysis of collected material
3. Mental incubation
4. Idea conception
5. Shaping and development

Creative action begins with research, which is later compiled and indexed. This material incubates within the unconscious mind of the creator, finally presenting the conscious mind with creative ideas [34]. These ideas are shaped and finally developed into a finished product. This strategy forms an iterative loop, where each stage of the process requires the organization of some sort of information from its predeceasing operation.

The creative process is based on a series of "complex deliberations about interdependent decisions that lead to design solutions" [25]. Ramesh and Sengupta note that knowledge about these 'deliberations' is typically lost as it is never recorded [24]. Having access to this level of knowledge could provide deep insight into a firm's design process and help to reveal its inefficiencies.

2.3 Managing Ideas and Developing Knowledge

Given the nature of the creative process as a knowledge-centric activity, much research has been conducted in the field of knowledge management for developing ideas [5, 25, 9, 26]. Modern tools for idea and knowledge management are based upon a central methodology and organizational system. Some commonly used methodologies include:

- **Outlining** – a method of organizing and categorizing information within hierarchical lists.

- **Brainstorming** – a creative process where a group meets to rapidly produce ideas and concepts, often in a stream-of-consciousness, quantity-over-quality format.

- **Mindmapping** – a method of visualizing an abstract idea by creating a graphical map of individual thoughts, which can be linked to imply relationship or hierarchy.

- **Version Control** – a procedure for managing the changes to a unit of information, tracking progress, and recovering from mistakes.

Most idea development tools implement one or more of these methodologies into some sort of organizational structure, along with an interface for interacting with the collected data. Following is a survey of approaches to idea management.

2.3.1 Paper-based approaches

One of the first technologies to facilitate developing knowledge was paper, which revolutionized the way in which information could be stored. Using paper ended up being a huge success, improving upon the time-proven techniques of carving rocks or painting cave walls. Its simplicity, low cost, and availability make it a logical medium for recording information. Paper can be easily organized into stacks and placed within files, or collected and bound to form books.

As the idea management process becomes increasingly complex, paper-based approaches reveal their inefficiencies. Being a physical media, there is no separation between the data and the media. This lack of separation makes information more difficult and cumbersome to index. When collected in large amounts, paper reveals another problem. Even though an individual piece of paper may occupy a small amount of space, when combined the result can be quite massive. Even though solutions for records management readily exist, these solutions generally only optimize the physical storage of paper and the information still remains in a static form.

2.3.2 Software-based approaches

Software-based approaches to idea management are generally more flexible their paper-based counterparts. Being virtual, software can dynamically manipulate and organize information at great speed. This has great potential for organizing large amounts of information and managing the connections within it. Commonly, idea management software will model everyday creative and organizational processes in a virtual environment, where information can be more easily abstracted and transformed.

OmniOutliner is a virtual environment for developing outlines. It expedites the creation and modification of complex outlines that can contain various multimedia elements.
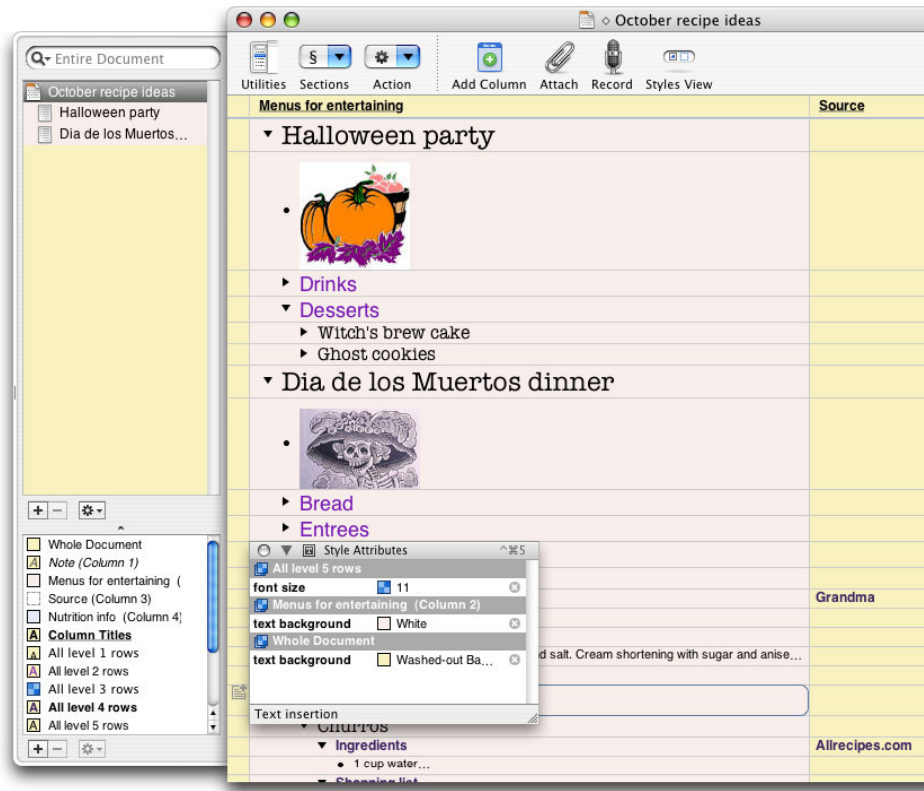
Figure 6 – OmniOutliner

A similar tool is FreeMind, an open-source program for transforming outlines into interactive mind-maps. These maps are displayed visually and can contain HTML links and simple graphical elements.
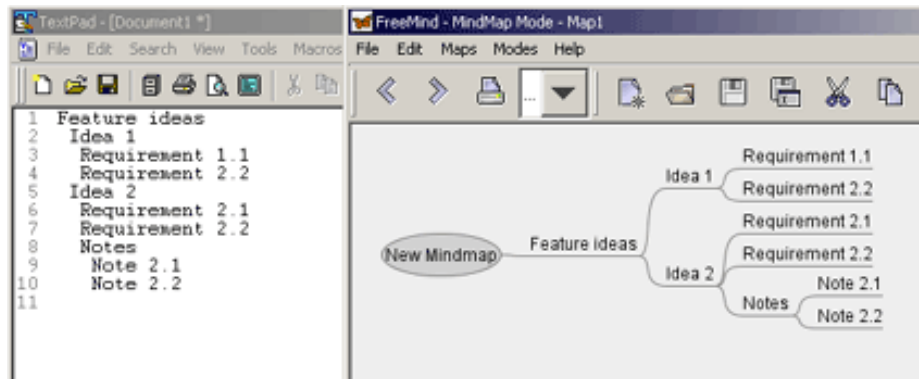
Figure 7 – FreeMind

Tinderbox is a software-based personal content management assistant. Similar to FreeMind, it uses graphical maps to both organize and visualize the connections within an information database. These maps can be richly described with text, links, or images.
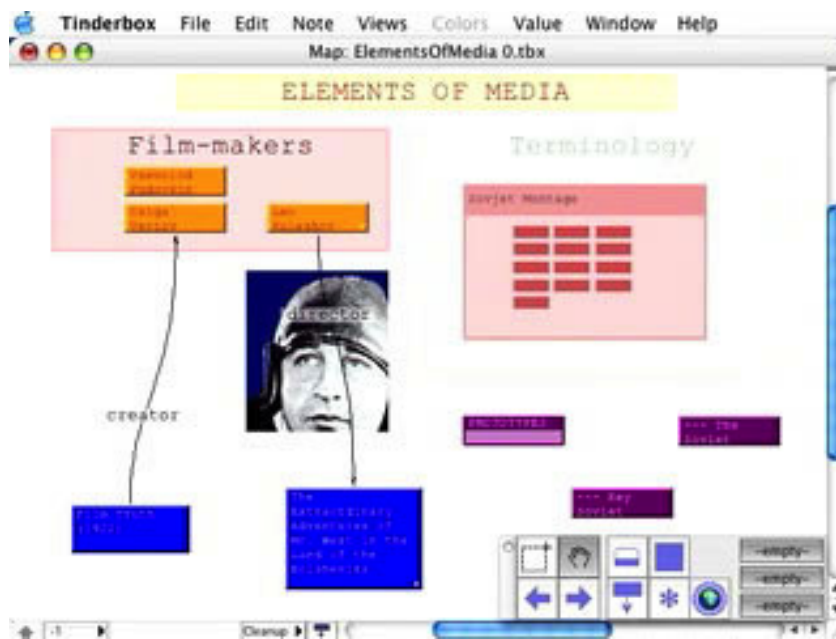
Figure 8 – Tinderbox

DEVONThink approaches idea management from an artificial intelligence perspective. Its algorithms discover connections within a collection of information, revealing relationships and helping to visualize trends.
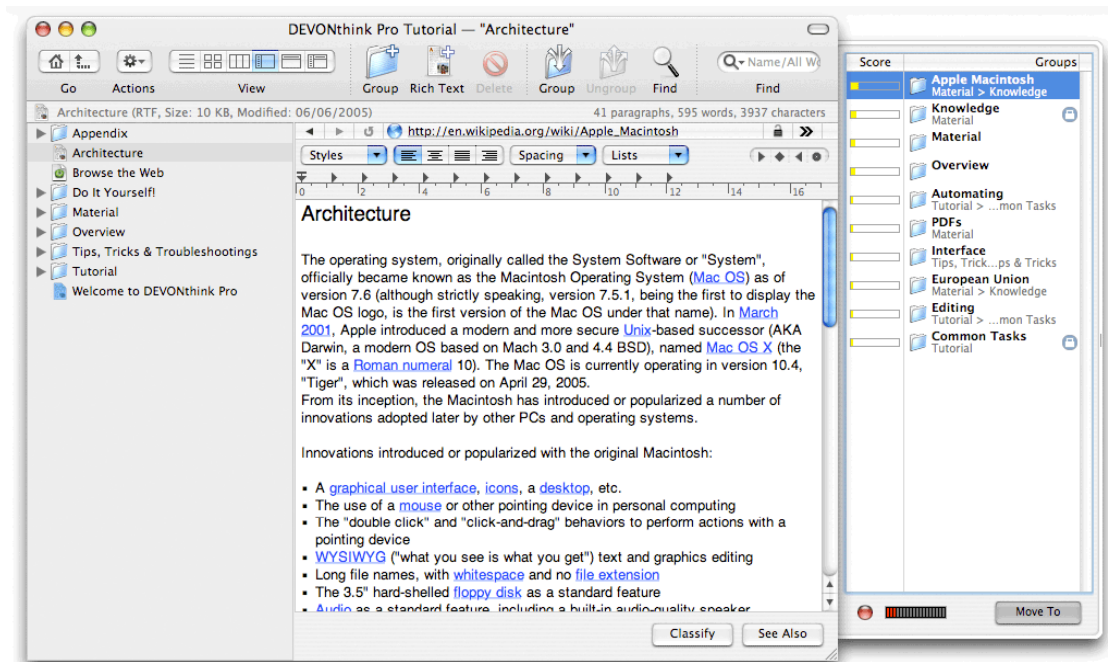
Figure 9 - DEVONthink

Backpack is a centrally hosted web-based information management system. It allows information to be stored within pages that can be organized by a user or user group. These pages act as centralized containers for associated media and can be organized with tags that describe the content.
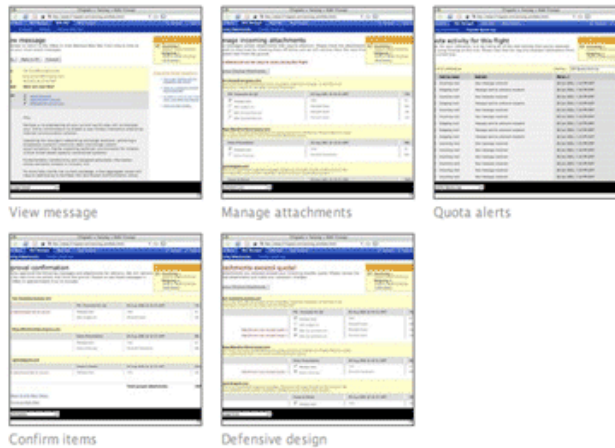
Figure 10 – Backpack

2.3.3 Distributed approaches

Distributed approaches to idea management create networks that connect people together for the collection and index of information. These

21

approaches support the collection of knowledge by establishing frameworks

for its subsequent description and organization. Similar to software-based

approaches, the distributed model reinterprets existing idea development

approaches in the digital realm. Its core advantage is connectivity, allowing

ideas to be managed in real-time on a global scale.

The Internet offers the same utility as paper, realized with today's

prevalent technology. The true innovation added by the Internet is not only a

new storage medium for knowledge, but also a global network for

distributing and organizing it. As with any technological innovation, current

modes of thinking and problem solving are the first replicated in a new

technology, after which, new approaches evolve that take greater advantage

of the degrees of freedom offered by the technology.

One such distributed approach is Subversion, an open-source version

control application. Subversion assists in the distributed development of a

collection of information, and generates a historical record of revisions.

Although it is most often used for managing source code, Subversion can also

be used to manage the development of large hierarchies of digital files.
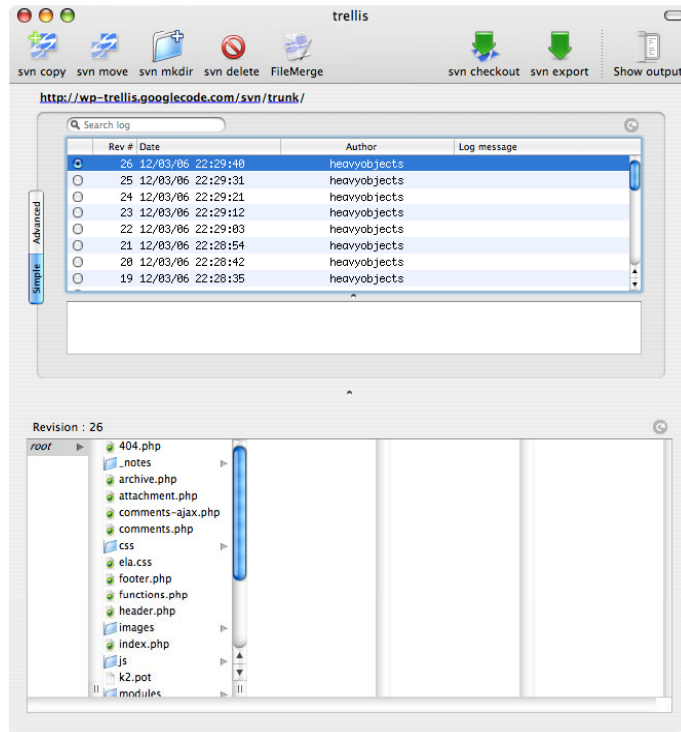
Figure 11 - SVNx, a Subversion client for Mac OS X

Wiki is a collaborative technology for organizing information on Web sites. Similar to Subversion, a wiki allows users to edit collaboratively-constructed content. Each revision is stored within a historical database. Whereas Subversion is aimed toward handling large collections of files, wiki systems are designed so that their content can be made available in a quick and uncomplicated manner and edited by anyone.

23
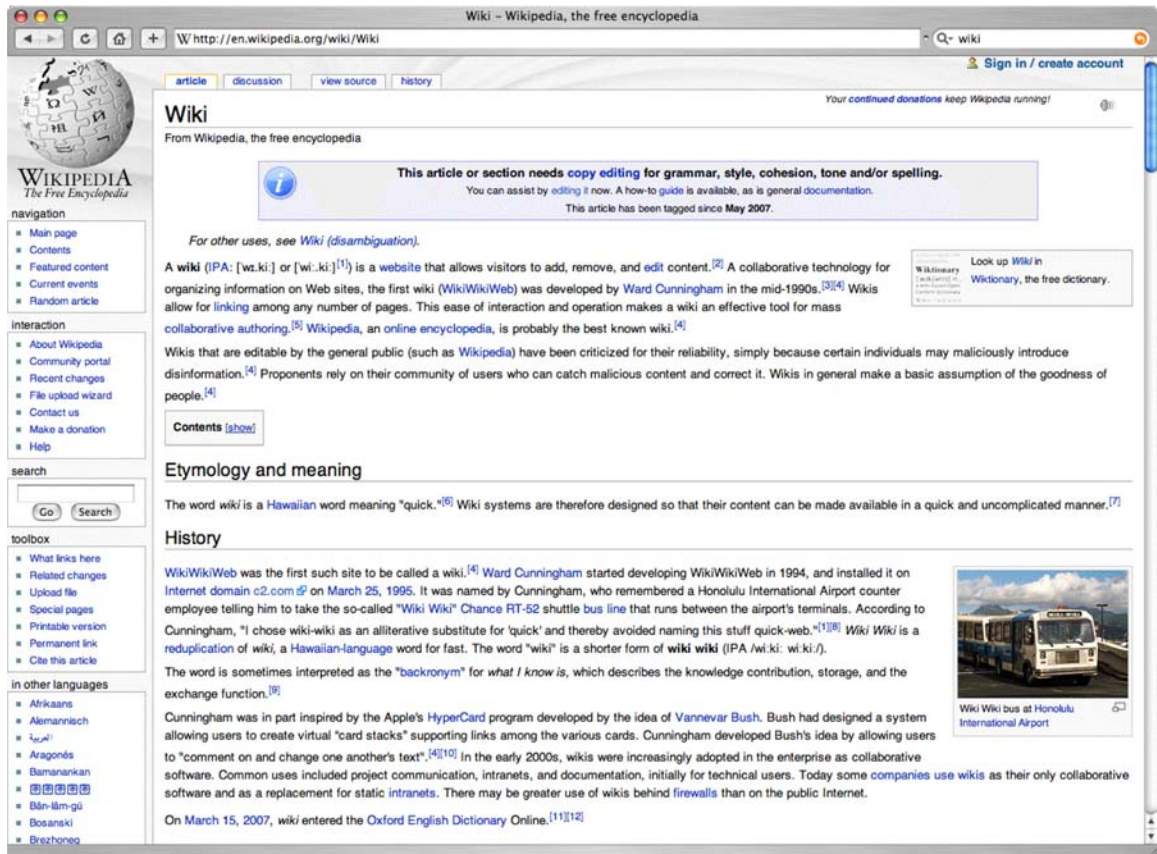
Figure 12 - Wikipedia, a popular wiki-based encyclopedia

This paper approaches idea management by using a similar web-based distributed idea management approach. Rather than developing a system from the ground up, this paper seeks to investigate the use of blogging, a technology historically developed to support web-based journaling, for assisting in the development of ideas. The next chapter examines the history, development, and design patterns behind blogging.

III. BLOGGING

Blogging began as the experimental implementation of publishing within a new electronic medium. Early adopters of the new format realized this potential and sought to develop a practical method of updating their websites with new content. Journaling was the obvious choice to build upon, as the format is well suited for providing updates over time. The first blogs were usually static web pages with regularly updated "What's New" or "Updates" sections. The process of updating these websites involved some technical know-how of content editing, coding, and file transferring.

As access to the Internet became more widespread, blogging became more accessible. Pitas.com was opened in July of 1999 and offered the first centrally hosted blogging service. A month later, Pyra Labs announced Blogger, and hundreds of other services soon followed. These sites made blogging easier by handling all of the technical aspects of updating a website. They usually presented a user with a simple posting procedure: type your content in the box and click a button. Another advantage provided by these sites was data indexing. Most systems were beginning to rely upon databases for information storage rather than static pages. The software powering blogging was being used to dynamically generate web pages based upon database queries, making it a much more dynamic and scaleable process.

The move towards database-driven systems had other advantages. Posts could be grouped into different categories, which would automatically be updated by the database. Commenting was added, allowing users to post their feedback to the content. The move towards standardized data formats saw syndication being applied to blogging through RSS and eventually Atom. Blogging was beginning to emerge as a powerful technology not only for journaling but also for content management.

The massive popularization of blogging saw the development of new applications. Business use of blogging has included not only internal blogs, used for intra-company news and discussion, but also external product, public relations, or CEO blogs. Blogging has also begun to become a popular practice among many politicians and celebrities, reaching out and interacting with their constituents and fans at a level never before seen.

Blogging is a technological innovation that is overturning the existing dominant technologies and publishing methods in the market. It is what Clayton Christensen called a "low end" disruptive innovation [3]. Blogging is not only disrupting the existing market of content management systems, but more importantly, it is disrupting the very basis on which information is created and distributed in our society.

By comparison, an example of a disruptive innovation in the generation of content is digital photography, which began as a low-end novelty, but has since overtaken and for the most part replaced the instant photographic market (Polaroid, etc). Similarly, blogging can be seen as a disruptive technology in the

way it has revolutionized web publishing. Many vendors of content management

systems (CMS) have been selling products that function similarly to blogs, only

cost thousands more. It is only a matter of time until CMS software will be

completely overtaken by blogging as both the standardized format and

methodology for web publishing [15]

3.2 Foundations

The word "blog" is an abbreviation of "weblog," coined by Jorn Barger in

1997. Being based upon the practice of journaling, the formalized definition of a

blog is a website where information is stored as separate entries and commonly

listed in reverse chronological order. Just as the theory and technology behind

blogging has evolved, it has found itself as less of a journal and more of an

organized format for sharing information.

Owing much to its predeceasing technologies, blogging simply extends

journaling into a richer, more organized process. The framework provided by a

blogging system helps to order and index the data, while abstracting the technical

processes of interfacing with a database. This abstraction makes the format much

more approachable, and is in a large part responsible for its success.

3.2.1 A Virtual Space

Beyond their basic function, blogs serve as virtual environments for

widespread communication. These virtual environments exist separately from the

physical realm, facilitating interaction where it would be otherwise impossible.

Blogging presents users with unfiltered, predigested content from both amateur and professional sources, leveling the playing field of information distribution and access. This functionality would be difficult to implement in a physical sense, as information is virtual in nature, having no real tangible form.

3.2.2 Personal Publishing

A key theme of blogging is personal publishing. The invention of the printing press allowed information to be duplicated and distributed fairly easily, but remained out-of-reach for many authors, as typesetting and printing services required a massive monetary investment. Even as printing technology advanced and became somewhat cheaper, it still remained much too expensive for the uninitiated. This frustration is what fueled the beginnings of the *DIY* (Do It Yourself) movement, which suggested that one should abandon the giant bureaucracy of printing altogether, instead seeking out smaller publishers or perhaps even buying an older press, fixing it, and printing it yourself [30].

Blogging, and the Internet in general, has been the emancipator of the DIY movement. By no longer requiring a physical medium to capture information, the startup capital to publishing is almost nil. Along with this theme, several of the most popular blogging systems have been developed as open source projects, inviting both modification and experimentation.

3.2.3 Business Models

As blogging has matured, its value for business has become more and more appealing. The appearance of 'niche' blogs from companies like Gawker

Media came hand in hand with the addition of heavily targeted banner ads to blogs. Commonly, bloggers are paid a commission for customers buying merchandise based on an ad click. Another popular strategy of self-supported monetization is the click-to-donate model, which solicits donations from readers.

A recent trend has been the establishment of paid posting models, which offer bloggers money in exchange for reviewing, linking to, or supporting a good or service within a post. Most pay-per-post models require that blogs pass a set of style requirements, are credible, and contain a large enough readership to warrant the cost. This model is still quite controversial, as some bloggers feel it is subversive to present advertisements under the guise of content.

3.3 Leading Systems

The infrastructures powering blogging advance proportionally with new developments in web technology. Although a multitude of systems exist, some of the most established are introduced below.

3.3.1 WordPress

WordPress is a free, open source project with a large base of users and developers. It includes all of the expected features and a unique plug-in system for creating custom actions based on *PHP* and *SQL* code. Also popular for its flexible theming engine, for which thousands of free, user developed themes have been written and distributed on the Internet, WordPress comes in two flavors, a single install and multi-user version. The multi-user version (called WordPress

MU) is the software that powers WordPress.com, a free service that boasts a membership of over half a million active blogs.

3.3.2 Blogger

Blogger is one of the oldest and largest hosted blogging services, in operation since 1999. Blogger doesn't provide much advanced customization, but makes up for this shortcoming by offering a large number of semi-customizable templates and a straightforward publishing interface. Google acquired Blogger in 2002, which helped to both promote and standardize the Blogger API, an Application Programming Interface for remotely publishing and retrieving information from a blogging system.

3.3.3 Moveable Type

Moveable Type is a commercial product produced by Six Apart, which has developed a large number of both professional and personal level blogging systems. Moveable Type is a feature-rich system, and well known for introducing the 'Trackback,' a feature that allows posts from to be linked with a reference. Customization is limited for personal use but readily available by purchasing a license of the software.

3.4 Strengths

One of blogging's most admirable features is its abstraction of the publishing process. By hiding most of the technical complexity of the system, the writer can focus more upon the content rather than the process of publishing.

The simplicity of the format is another strength. Blogs present writers with straightforward posting and administration environments, where content can be easily moderated.

Not only does blogging make the process of publishing information easier, but it also makes that information more organized and accessible. Blogging abstracts how the information is contained within a database by offering higher-level organization structures, along with the methodology of retrieving and filtering the information displayed. Syndication technologies take the next step in offering a platform for broadcasting this information. Being indexed, the format is also inherently standardized. This standardization provides a template that accelerates modification and plug-in development by not having to redefine commonly used functions.

Blogging invites conversation about the content it displays through commenting. The conversation is normally displayed near or around the content of a post, along with a form to add another comment. This visual link helps keep to the conversation within context and solicits both discussion and criticism. Being an indexed system, these comments can be syndicated through a newsfeed, so that one may remotely follow the conversation via a newsreader.

3.5 Weaknesses

A major problem with blogging is its fundamental preference for new material. This flaw stems from the standardization of the reverse chronological display format, where visual precedence is given to the most recently published

material by placing it above its preceding entries. Older, possibly more popular content is eventually cycled out of the main display chronology and archived, often never seeing the home page again. The drive for fresh material can also produce a body of vacuous content, as bloggers attempt to captivate audiences by providing new, yet useless information.

Being born in journaling, blogging inherits its style of voice. Although journaling can be formalized, it is often written in an informal voice, where the author is the main audience. Applied to blogging, this informality can make information seem less credible. The informal tone of blogging could be a product of the triviality of the process; whereas, clicking a single button abstracts a procedure that used to take massive amounts of power, money, and time.

3.6 Design Patterns

Behind blogging is a community of researchers, programmers, and designers guided by the desire to collect, organize, and visualize information. By experimenting with the technology, several design patterns have developed, affecting blogging on both an individual and community-wide basis. These patterns are not clearly defined, and like most guidelines, can be applied in a variety of ways. This section discusses the design patterns behind blogging and its community of architects, designers, and developers.

3.6.1 Architecture

Most blogs share a similar visual architecture. This similarity is evident as blogging is in itself an extension of web technology, which has several clearly defined methods for displaying and interacting with information. Using these guidelines, most blogs are built using the following structure:

- **Header** – an image, title, or logo. Sometimes accompanied with a quote or phrase that captures the spirit of the information contained within the blog. May also contain navigation elements.
- **Content** – the area in which the information is displayed, within a reverse chronological list. Any information relevant to the post, including categories, tags, publication and modification dates, is attached to its content.
- **Sidebar** – often acts as a holder for secondary content or supplemental navigation. Sidebars also commonly contain links to other blogs or advertisements.
- **Footer** – may include copyright information, terms-of-use, signatures, or group affiliation icons.
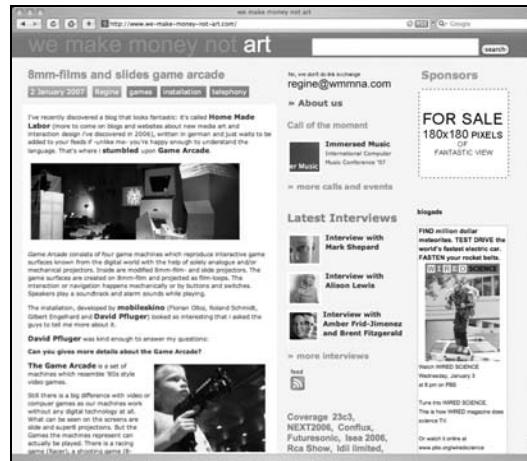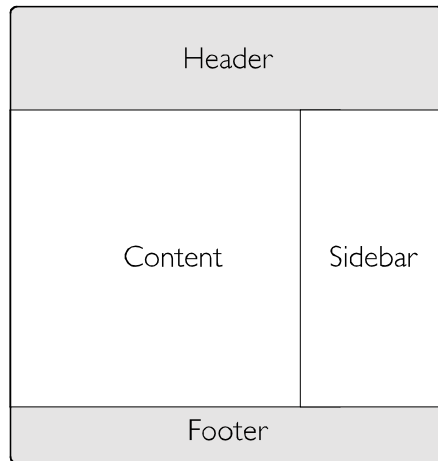
Figure 13 - Typical blog architecture compared to an actual blog.

Whereas this is a commonly encountered structure, it is by no means the only pattern used. There are many variations upon the above model, some of which include another sidebar that either wraps around the content or rests at the flank of the first sidebar. A secondary sidebar is especially useful when displaying advertisements, links, or additional navigational elements.

3.6.2 Content

At the heart of the blog is its content. The content area acts as the main display for information, and is where users will spend the most time. Within this area, posts are displayed in a reverse chronological list. The content area is subdivided into individual units of information called *posts*. Each post can be further divided into its content and information that describes the content, called metadata. This metadata usually contains the title of the post, historical

information such as publication and modification dates, and a list of comments posted by readers, within a similar reverse chronological display order.

The content area is multifunctional in the types of information it displays. Along with displaying the most recent posts, the content area is also used for presenting archives or search results. This functionality is provided by a *query*, a set of written requirements that tell the blogging system which data to fetch from the database. Queries are usually written in SQL (<u>S</u>equenced <u>Q</u>uery <u>L</u>anguage), a popular computer language used for interacting with databases.

3.6.3 Organization

Being founded in journaling, blogs typically rely upon the reverse chronological information display format. Most systems have the functionality of listing and grouping content into different organizational systems. Some of the most common structures include:

- **Archives** – a summary of all the posts within a given time period. Many systems support returning posts grouped and paginated within sets of weeks, months, or years.
- **Categories** – a short and simple classification defining what area a post applies to. For example, a post on a music blog describing a concert happening in the future could be assigned to the 'Concerts' category. Most systems that support categorization can generate category archives, which are simply lists of all the posts in one category, over time.

- **Tags** – a broader way of looking at categorization. Rather than attempting to assign one category that represents the post, the blogger is able to 'tag' the post with sets of words that describe its content. This can be especially helpful if a post covers multiple topics.

3.6.4 Theming

One of the factors attributing to the widespread success of the blog format is its ability to be styled with both system and user defined themes. Theming is the process of changing the look of a blog while retaining its content. This process is achieved by a mix of html markup, stylesheets, and template tags. The html markup contains a skeleton of page elements. Within this skeleton the anatomy of the layout is defined, and linked to a set of rules, which define that section's visual style, called a stylesheet. Inside the sections of the html markup are template tags that tell the blogging system which information to fill within the skeleton.

The following three screenshots in the figure below are of the same blog styled with several different themes. Notice the how the content remains the same while the rest of the interface is transformed by the theme. Below are Vertigo Squared (A), Qwilm (B), and AndyBlue (C) – three free, open source themes available for WordPress.
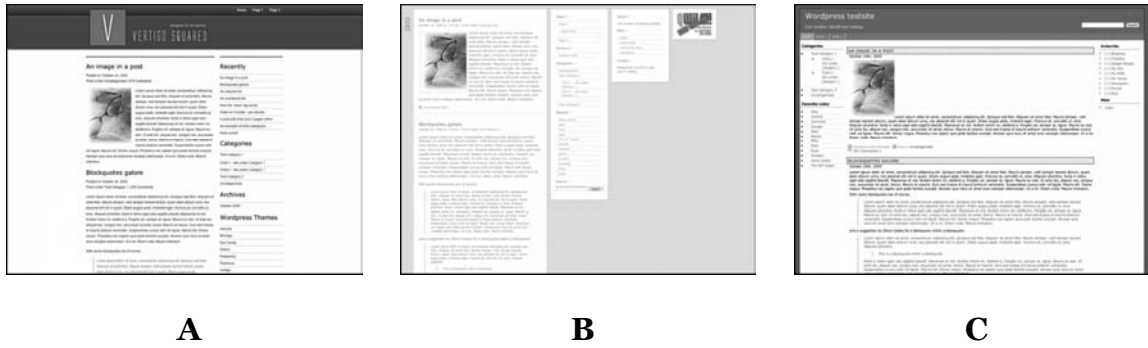
A   **B**   **C**

Figure 14 - The same blog styled with three different themes.

The process of separating the visual style from the layout is what makes theming portable. All of the files related to a theme can often be packaged and distributed via the Internet, where others can both consume and modify them. Several large repositories of themes and styles exist, one of the largest (albeit not necessarily blog-focused) is the CSS Zen Garden[1], an evolving, user-contributed gallery of stylesheet-based design templates.

3.6.5 Community

Building upon its foundations as an open platform, blogging is driven by a community of bloggers, collectively referred to as the *blogosphere*. It is this community that is in a large part responsible for developing the format and discovering new ways for managing and sharing information. As the blogosphere continues to inflate, it proves increasingly more difficult to keep up with all of the new information it generates. This large influx of information has necessitated

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[1] http://www.csszengarden.com

the development of several standardized systems for inter-blog reference and communication:

- **Permalink** – a *perma*nent link to a post. These are necessary since blogs are commonly updated and posts may disappear from the front page chronology. By providing a permalink for each post, others can more easily access and reference content.
- **Trackback** – combined with permalinks, trackbacks are a way for two posts on different blogs to reference each other. When a post is published that includes permalinks to another website, the blogging system will *ping* the linked blogs and inform them of the reference. These trackbacks will usually appear within the comments of a post and include a brief abstract of what the other blog said about the referenced post.
- **Newsfeed** – a syndicated list of updates to a site broadcast in a variety of formats, with RSS and Atom being the most common. Newsfeeds allow external *feedreaders* to grab and digest the content of blogs, making it easier to review the most recent updates of a large number of blogs at one time.

The colossal amount of information generated by blogs is overwhelming. With blogging becoming commonplace, the daily batch of new content becomes more difficult to comprehend without some sort of directory. Very similar to the directories created during the infancy of the Internet, a new trend being applied

to blogging is social bookmarking, a method of storing, organizing, and sharing links through the application of *folksonomy*, a collaborative method for categorizing content based on human-assigned labels. By allowing the users of a system to organize it, the information is more relevant, and can lead to the development of new vocabularies for describing content. A few popular social bookmarking services are del.icio.us[2], digg[3], and Technorati[4], which claims an index of over 70 million blogs.

The community-centric aspects of blogging are a crucial part of a broader virtual space provided by blogs. Within this space, readers can communicate with writers and other bloggers. This space for interaction is a vital difference from newspapers, which are delivered to people's doorsteps and lack the feedback model inherent to most blogs.

3.7 Emerging Design Patterns

As blogging proves itself more valuable, so does the research driving its evolution and innovation. Research into how to better present information has caused adaptations to occur in the information architecture behind blogs. New visual styles and programming techniques have seen 'blog styling' become an actual profession. Other new technologies have also found themselves linked together with blogging to create new features and user experiences.

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[2] http://del.icio.us
[3] http://www.digg.com
[4] http://www.technorati.com

3.7.1 Architecture

Web developers are realizing that the line between blog, content management system (CMS), and website isn't as clear as it used to be. Commonly, a blog can be modified to act as a CMS, powering complete websites from one centralized system. Such developments have sought the addition of more CMS features to blogging systems, such as the "Pages" model of WordPress, which allows posts to exist within a hierarchy outside of the normal blog chronology.

The resistance of the typical reverse chronological style is also an emerging theme. In order to make their content more relevant and useful to readers, bloggers have begun to classify certain posts as 'Top Stories.' This practice gives more visual importance to the specially tagged posts. Exactly opposite are 'Asides,' a strategy of marking less interesting posts. Asides are given less visual importance. Notice the smaller asides above the larger blog post in the figure below.

Figure 15 - 'Asides' are posts that are given less visual impact.

Blogging invites discussion through commenting, and for popular posts these lists of comments can accumulate to a giant mess, organized only by time. The method of "threading" comments initiates a hierarchy to the chronology, allowing comments to be placed underneath other comments. A different strategy is "Inline Commenting," which allows users to tie a comment directly in-line with the content of the post:

Figure 16 - Inline commenting

3.7.2 Theming

The popularization of theming and visual programming has lead to the development of several large theme projects, most notably k2, both a modification and theme for WordPress. What makes k2 different from most themes is its integration of dynamic tools such as *LiveSearch* and *Rolling Archives*. *LiveSearch* is re-tooling of the searching methodology behind WordPress that updates the search results without having to reload the page altogether. *Rolling Archives* is a similarly dynamic feature, which allows a user to move a slider 'back in time' to quickly update the posts being displayed, without refreshing the page.
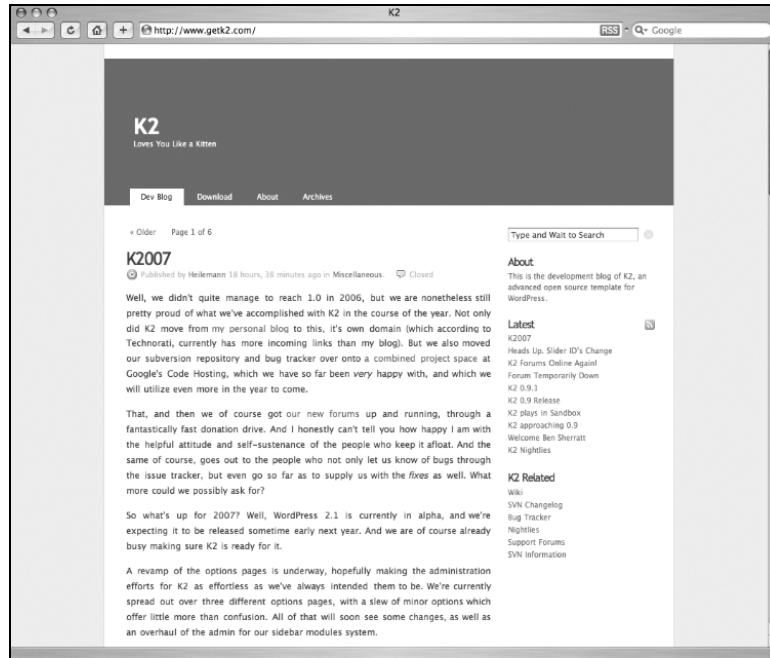
41

Figure 17 - k2, an advanced theme for WordPress

Another advancement in theming is the use of semantic classes, which extend the vocabulary assigned to page elements and allow more robust theming. Semantic classes add more description to the page layout structure, which can be linked to a stylesheet to allow for more context-sensitive styling. For example, a block of content assigned semantic classes would not only include any user defined styles but also styles related to the context of the post, for example time and category. This proves useful when developing a robust theme, which might assign the title of every post within a certain category a certain color, depending on the time it was posted.

3.7.3 Experience & Integration

Recent trends in web development have sought to redefine the ways in which users interact with the Internet. One of the areas given a large amount of research is user experience (UX), the overall experience and satisfaction a user has when using a product or system. The application of UX design techniques to blogs is an active area of research by both UX specialists and interaction designers.

AJAX, shorthand for 'Asynchronous Javascript and Xml,' is a collaboration of several technologies designed to dynamically update information on a webpage without refreshing it. The *LiveSearch* and *Rolling Archives* features of the k2 theme for WordPress rely upon AJAX to function. As the usage of AJAX becomes more prevalent on the web, its functionality in blogging will increase substantially.

Other technologies beginning to be fused with blogging are Flash, GPS, and remote connectivity. Flash content is often used to create visually rich interactions, and often blogging systems will act as a backend content management system for a flash-based website. GPS is seeing its integration through geotagging, a method of embedding location-sensitive content within blog posts. Web services such as Flickr and Google have also released APIs for passing data back and forth between themselves and external applications. An example of API usage would be the inclusion of a recent photos section on the sidebar of a blog, which communicates with a photo hosting service and returns the most recent photographs posted by a user.

IV. TRELLIS

Trellis seeks to help solve the problem of developing rapidly-changing, scattered ideas by providing a scaffold onto which knowledge can be stored, information organized, and feedback collected all within one centralized, secure location. It is implemented as a collaboration of two technologies: blogging and radial mapping.

4.1 Blogging

Trellis abstracts blogging into a tool for developing ideas by repurposing its abilities to store, organize, and display information. Posting an entry is equivocal to writing in a sketchbook, except the post can consist of any bloggable media – be it text, pictures, sounds, or video. The organizational structures of blogging are also adapted to provide a system for codifying the collected information. Commenting, a feature common to most blogs, is used as a way of capturing feedback and promoting collaboration. Upon a foundation of blogging, Trellis both inherits and extends its functionality.

The blogging element powering Trellis is WordPress, an open-source web publishing software. Building upon WordPress' advanced plug-in and theming architecture, Trellis is delivered as a modular theme, which transforms the

blogging environment into a virtual space for developing ideas and evolving knowledge.

4.2 Radial Mapping

Radial maps are visualizations of hierarchical structures that place the highest order node at the center of a circle, upon which concentric rings outward represent children of ascending generations. Clicking on a node will re-center the hierarchy with the selected node at the center of the circle. It is a very useful tool for visualizing complex hierarchies of information within a small screen area.
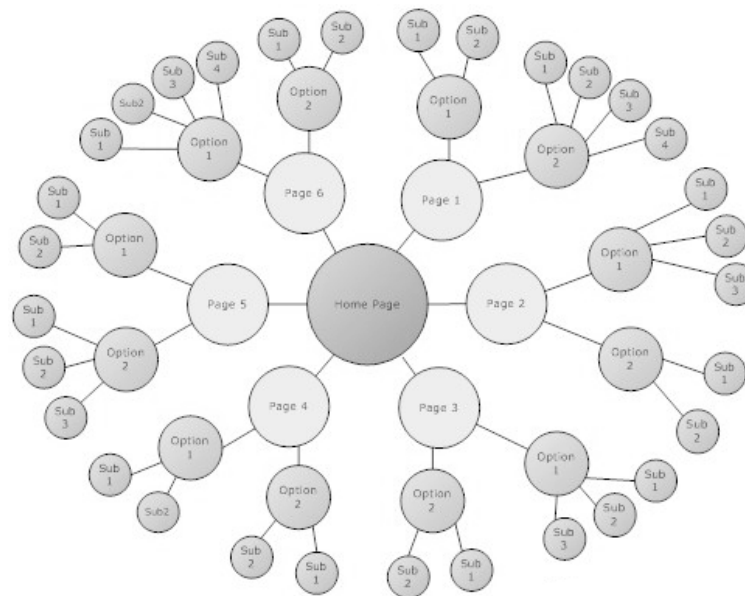

Figure 18 - A radial map

As an idea accumulates information it will become more difficult to follow without any organizational system. Trellis establishes a hierarchy to organize

45

information and implements a radial map for visualizing it. This radial map acts as a sort of indexed notebook where, at a glance, one can gain an overall picture of the growing knowledgebase of relevant information.

Trellis relies upon SpicyNodes, a flash-based radial tree mapping software, to fulfill its radial mapping element.

4.3 Approach

Trellis facilitates idea development by establishing both a hierarchy and a chronology for storing knowledge. The hierarchy simplifies the organization of collected information by establishing a singular definition upon which a large amount of information can be ordered. The user is free to apply this rule in any form to organize relevant data. By maintaining an organized knowledgebase, information related to the developing idea is stored within the same environment as the idea itself. This organized, information-rich environment helps to stimulate useful discussion through the chronology.

The chronology exists as a story of idea development, a location where new thought processes can be stored and older ones reviewed. Such a method of storing thought lends itself to being based on time, and a blog-like, reverse-chronological display format is used to trace the course of idea development. By maintaining a development blog, thought related to an idea can be outlined, discussed, and reviewed, over time.

The combination of a knowledgebase and development blog creates a virtual container for ideas. Such a method of capturing an idea could prove to be

valuable to those developing creative projects of any kind, as the system helps to not only guide development but also record progress, from one centralized container. Trellis could also be quite useful for demonstrating how one creatively solves problems. A practical example is the process of hiring someone to be part of a creative team. Résumés and portfolios are proof enough of achievement or talent, but there is no real system for qualifying how someone creatively solves problems. Trellis could facilitate a solution for this need, giving insight to the creative habits of its users.

Trellis is not intended to replace existing ideation methodologies or act as project management software. Its intention is to provide a centralized environment for storing information related to developing ideas. Trellis facilitates ideation by visualizing this information in a way that makes it easier to understand the internal workings of a developing idea. As ideas become clearer and more concrete, Trellis may no longer be needed for building ideas but can still act as a historical resource and part of a broad personal knowledge base.

4.4 Design Process

When the idea for Trellis was conceived, a new blog was created to test the concept. Since the best way to prove something works is to design and test it within a real-world application, the goal of the blog was the development of itself – therefore both testing and defining the methodology proposed by Trellis. In the beginning, ideas were very abstract and through the practice of using the blog as

a research tool, modifications were made to the underlying blogging system and results were logged and discussed within the blog.

4.4.1 Beginnings

One of the initial changes made to the blog was the integration of several WordPress plugins. Plugins are prewritten chunks of code that perform an action or modify the behavior of the parent blogging system. WordPress' plugin architecture is very robust, as it allows plugin code to be tied to a specific action, such as when a post is made, or act as a filter, such as returning posts that meet a certain criteria. The first plugin added to Trellis was "Dunstan's Time Since," a simple plugin that displays the date of a post as the difference from the point it was written to the time it is viewed. This behavior was quite helpful in making the post datestamps more relevant to the chronology of the blog:

Figure 19 - The Time Since plugin calculates datestamps on relative terms

A name for the approach was then developed. Given the nature of a system for developing evolving knowledge, metaphors for growing, gardening, and cultivation were selected as generators. In a brainstorming session, these generators produced a massive list of possible names. The search produced an excellent metaphor in the word 'trellis.' Just like the commonly seen companion

to a growing tomato plant, Trellis acts as a scaffold for cultivating ideas and ripening knowledge. This same feeling was carried out in the logo used to represent trellis, designed using the same garden metaphor.
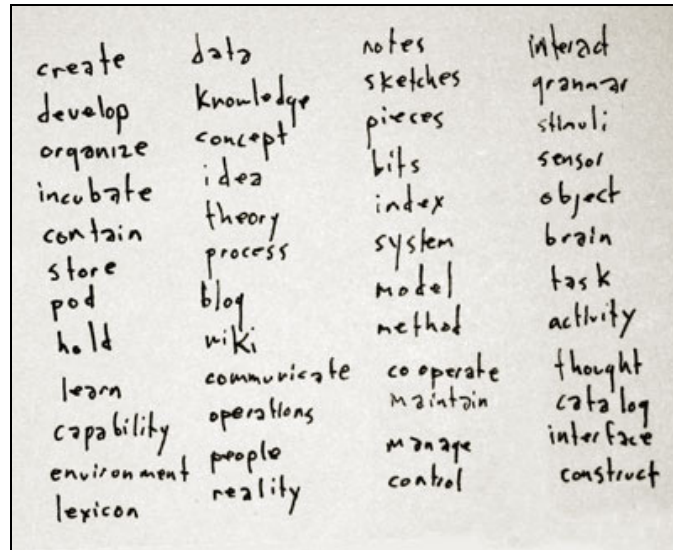

Figure 20 - A brainstorm of name and idea generators

Figure 21 - The logo of Trellis.

4.4.2 Learning From Nature

As more posts were compiled, it was realized that an organizational system was needed to structure the developing knowledge. Initially, this was accomplished using WordPress' category system, and further supplemented by

49

the addition of a plugin to support tagging. Even though these methods allowed posts to be better organized, it was lacking in how these posts were visualized. Soon it was realized that simple categorization alone was not enough to facilitate a developing idea – a structure was needed that could both contain and visualize the collected information.

This prompted research into the organization and visualization of information. A survey of man-made and nature-based organizational systems revealed that the most effective methodologies were usually the simplest and most flexible. This was evident in the pattern of seeds in a sunflower pictured below - a complex organization simplified by a singular rule. Further research into nature revealed even more examples of self-sustaining, recursively designed systems. It was learned from nature that by defining an implicit structure, ideas and knowledge could be more easily mapped and understood.
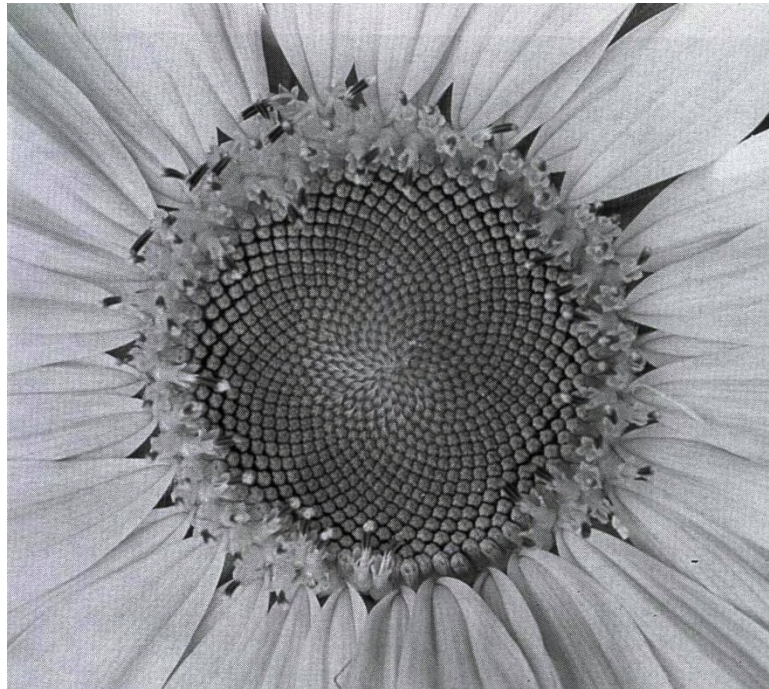
Figure 22 - The seeds of a sunflower are ordered in a beautiful, compact spiral formation

Nature is an organized hierarchy. Just as this sunflower orders its seeds upon a fractal-based hierarchical spiral, so do humans in the ways we are structured (arms leading to fingers, arteries branching to capillaries), act (social hierarchies, family trees, structures of government), and think (listing, outlining, breaking down larger problems into smaller ones). Taking suggestion from nature, it was decided that a hierarchical method was the most relevant and perhaps even an instinctual approach for organizing information.

The initial implementation of a hierarchical structure within Trellis was the adaptation of an open-source Tree class written for php. This class, like the organic system it is based upon, uses a single recursive operation to organize and

51

traverse its own structure. This adaptation required some intensive modification to WordPress, yet functioned as prescribed:
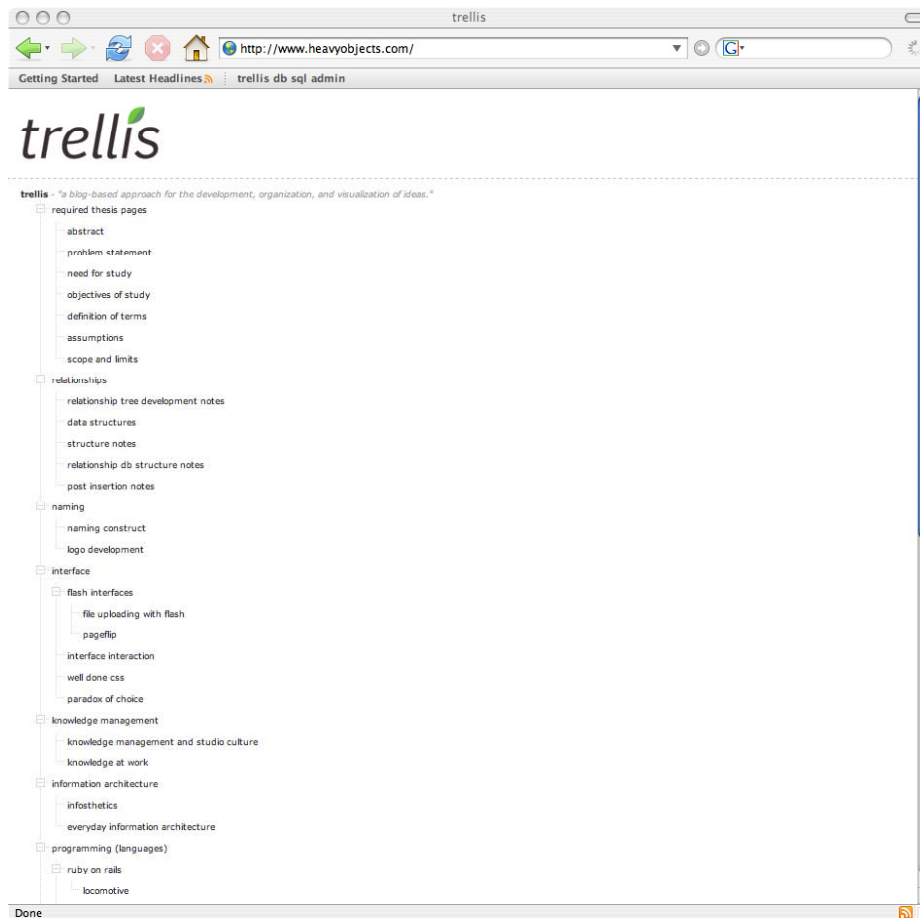

Figure 23 - A screenshot of the initial Trellis interface, visualizing the hierarchy

Using the implicit structure of hierarchy, new subsystems for organizing knowledge could be developed. One such example is a method for organizing citations from books. Within the hierarchy, a branch named 'Books' was created. Within this branch, individual branches were developed for each book to be cited. Within these posts, citations were recorded along with their respective page

numbers and reference information. The result is an organized citation library, which has proved to be a helpful tool in the writing of this paper.

4.4.3 Iterative Simplicity

As the hierarchical structure inflated with information, a new problem developed. Even though the structure was well organized, it was difficult to interpret its development. This problem stemmed from the fact that the structure was only visualized hierarchically. It was like a table of contents for a book which has no story. The need for a system to visualize both the developing story and its growing body of knowledge soon became apparent.

Research into how to solve this problem began a wave of simplification. It was discovered that WordPress already supports a system of hierarchical organization though Pages, which are static blog posts that exist outside of the regular blog chronology. By using this system, the code-base of Trellis was simplified drastically, as the custom-designed php Tree class was no longer necessary. This simplification also provided clarity to the nature and definition of Trellis. The hierarchical knowledgebase could be used as an index for collecting and organizing information, and the chronological blog could act as a story of the developing ideas.

Through the synthesis of a hierarchy and chronology, the blog was developing into a rich knowledgebase of research on ideation, organization, and visualization. Ideas were becoming more solid as to what utility a blog can provide when applied toward research and development. These thoughts were

53

stored inside the blog, and the conversations with friends, colleagues, and collaborators were also recorded, directly in context with the content. The historical ability of Trellis was beginning to make itself known, as the blog archives provided details of what was going on and being worked on early in the development process.

4.4.4 Organic Adaptation

The design of Trellis is self-sustaining in the way it systematically seeks to better organize and visualize itself. The implicit research goal of Trellis set its development into motion and accelerated exponentially as new methods were conceived, tested, and implemented. Such a process isn't anything revolutionary, as it has happened - and is happening now - actively throughout nature.

Being developed at the speed of growing knowledge, numerous workarounds were made in order to keep the system evolving. Although many of these workarounds began as simple proofs of concept, they soon saw themselves being heavily used and relied upon so that the system could continue to evolve onward.

4.4.5 The Activity Feed

As the core of the system became better defined, several of the workarounds used to build it began to call attention to themselves. One of these areas needing closer attention was the visualization of changes within the blog and knowledgebase. By default, WordPress does not broadcast the addition of the hierarchical pages within the chronology of the blog. This was a problem, as the

notice of additions or updates to the knowledgebase were not visible to the user
by default. Numerous ideas were developed as to how to trace the development of
a hierarchy within a chronological timeframe. Using what had been learned from
nature, several visualization concepts were developed that explored the concept
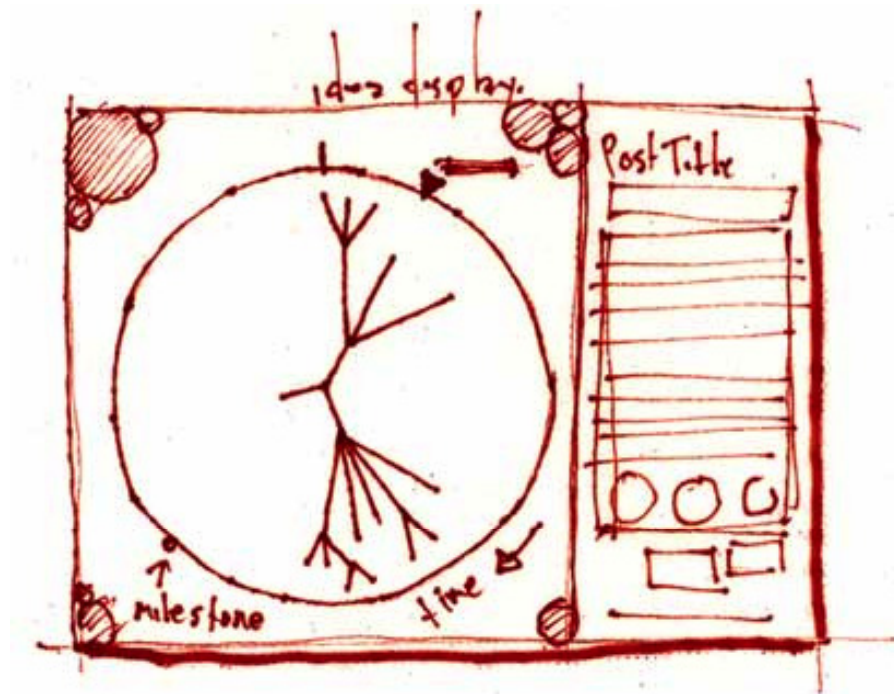of an evolving hierarchy.

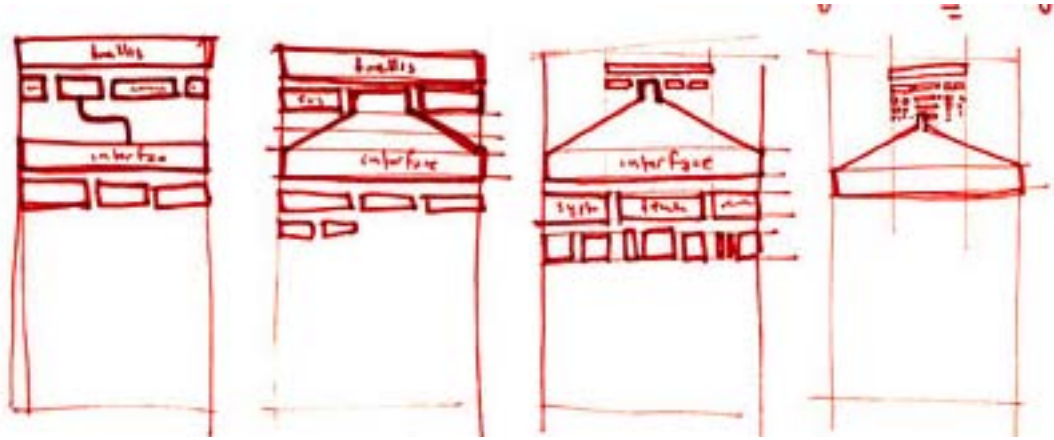**Figure 24** - The 'Clock' method. Ink on napkin.

Figure 25 - The 'Stack' method

These ideas, although visually interesting, lacked both usability and function. In one of several moments of frustration, all research was cast aside to spend time on Facebook, a popular social networking website among college students. Facebook had recently undergone a major redesign and implemented the 'newsfeed,' a dynamically generated reverse-chronological list of updates to the profiles of friends within one's social network. The newsfeed concentrated changes in a social network to one centralized area, rather than having to skip from profile to profile, attempting to ascertain new information. This is illustrated in the figure below, taken from my own newsfeed, just moments ago:

56

Figure 26 - The Facebook Newsfeed

It was realized that a similar concept could be modeled within Trellis. Just as the Facebook newsfeed shows updates to a social network over time in a bloglike reverse-chronological list, so could Trellis visualize updates to the blog and knowledgebase. This approach was delightfully easy to implement, and only required modifying a single database query that told the blog which posts to display on the front page. The result is a list of updates, in reverse-chronological order, which visualizes the result of developing knowledge over time:
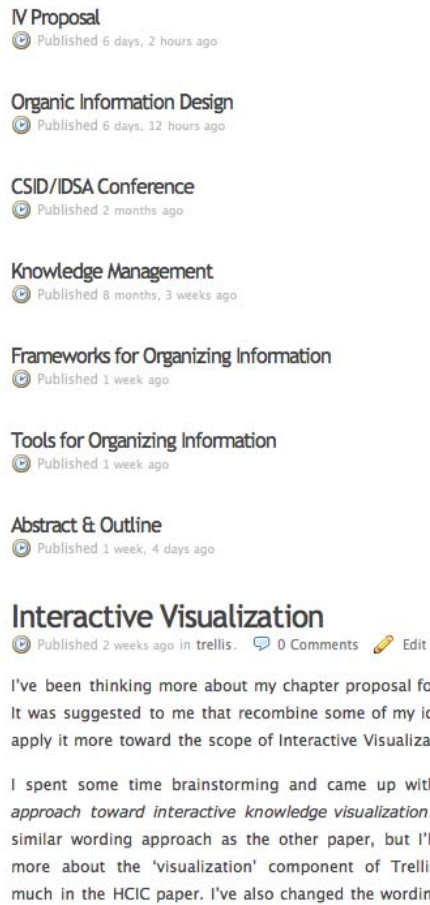
57

IV Proposal
Published 6 days, 2 hours ago

Organic Information Design
Published 6 days, 12 hours ago

CSID/IDSA Conference
Published 2 months ago

Knowledge Management
Published 8 months, 3 weeks ago

Frameworks for Organizing Information
Published 1 week ago

Tools for Organizing Information
Published 1 week ago

Abstract & Outline
Published 1 week, 4 days ago

Interactive Visualization
Published 2 weeks ago in trellis. 💬 0 Comments ✏ Edit

I've been thinking more about my chapter proposal for the IV paper, due March 15. It was suggested to me that recombine some of my ideas from the HCIC paper, but apply it more toward the scope of Interactive Visualization.

I spent some time brainstorming and came up with a title: *Trellis: A blog-based approach toward interactive knowledge visualization*. I dig it. It seems to take a similar wording approach as the other paper, but I'll have the opportunity to talk more about the 'visualization' component of Trellis, which wasn't explained as much in the HCIC paper. I've also changed the wording to *knowledge visualization* ,

Figure 27 – A working prototype of the Activity Feed

4.4.6 Hierarchical Visualization

Another area needing attention was the visualization of the knowledgebase. The knowledgebase had previously been displayed as a simple hierarchical list, which works well for a small collection of posts. But as the hierarchy expands, this method of visualization fails. This is demonstrated in the figure below, which has been modified to wrap in multiple columns (the original list spans over 5000 pixels in height):

Knowledgebase
trellis
  interface
    interface interaction
    well done css
    paradox of choice
    characteristics
    research
      trees
        trees in nature
          budding animation
          brocolli fractal
            fractal food
          fibonacci numbers and nature
        trees as data structures
          phyllotactic patterns for tree
          layout
          radial tree
          treemaps
            circular treemaps
              squares in circles
              circle packing
              packing diagrams
              apollonian circle packings
            voronoi treemap algorithm
          plant post
          circular and horizontal trees
          semaspace
          bubble trees
          shrub - variations on tree
          structures
          infoslices
          user experiments with tree
          visualization systems
          dome tree
          evolutionary visualization
          amaznode
          animated graph exploration
          hyperbolic tree
            hyperbolic focusing
            bubble browser
            hypertree w/source
            inxight visualization
            treebolic
          mind maps vs trees
          to draw a tree
    abstraction
    usability
      focus+context
    fractals
      sierpinski triangle
      space-filling curve
      koch snowflake

mandelbrot set
number spiral
spiral packing
bibliodyssey
books
  The Visual Display of
  Quantitative Information
    six principles of graphical
    integrity
    principles of graphical
    excellence
    characteristics of graphical
    displays
    data-ink
    multifunctioning graphical
    elements
    clarity in hierarchy
    well-designed small multiples
    aesthetics in displays
    graphical shaping
  Envisioning Information
    escaping flatland
    small multiples
    high information displays
    micro/macro readings
    1+1=3
    imhof's color rules
  Improvisational Design
    limitations of templates
    role of designer
sparklines
  SparkStats - wp plugin
del.icio.us visualization
pathway
history flow
ask ET posts
  project management graphics
  websites as graphs
development
  variables to plot
  concepts
    spiral-on-spiral method
    clock method
      information display
        things to display
        block layout
        detail sketch
        100% height
      technical issues
        clicking on a node
        flash / java messages
        posting
      visualization
        node info

highlighting
prototypes
  early version
stack method
  sketches
  Hybrid Interface Mockup
  interacting
  style sheets
Organic Information Design
system
  research
    memory
      photosynth
    creativity
    copyrights, licenses, and
    ownership
    ethnography
    version control
    technologies
      ajax
        client / server
      ruby on rails
        locomotive
        in-browser ruby
      flash
        SWFObject
        file uploading with flash
        pageflip
        wordpress / flash
        tweening library
        external api
        flash / javascript integration
        kit
        Xilhouette
        obedit
      cakePHP
        cameleon
      wordpress
        trackback
        wordpress themes & plugin
        development
        tags
        footnotes plugin
        wp as cms
        search pages plugin
        page syndication
        frames
        registered only plugin
        brian's latest comments plugin
        k2
        structured blogging
        zeitgeist plugin
        WP-Print

SOAP
script.aculo.us
  lists with php
  projax
adobe flex
  flex online complier
  flex blog
  query vars within flex
  rich text editor
  style explorer
  file uploading
  flash in flex
  iframe in flex
  flex and amfphp
  tree control
SpicyNodes
ASDoc
  nifty corners
blogging
  structure
  research blogs
information
  electronic brainstorming
  devon technologies software
  mind mapping software
  getting things done
  information architecture
    infosthetics
    everyday information
    architecture
    IA class notes
  Knowledge Management
    knowledge management and
    studio culture
    knowledge at work
  Frameworks for Organizing
  Information
  Tools for Organizing Information
    url rewriting
development
  history
  relationships
    history by versioning
    the old approach
      post insertion notes
      relationship db structure notes
      data structures
      relationship tree development
      notes
      structure notes
      moving & organizing nodes
        database schema
      history table

sketches
naming
  naming construct
  logo development
milestones
  technical
  temporal milestones
Papers & Presentations
  HCIC Paper
    ideas
    Proposal
    Blogs
      Outline
      Draft
    Trellis
      Outline
      abstract
      Draft
  AU Graduate Forum Presentation
    Ideas
    Poster Draft
    Poster Copy
  AU Thesis
    required thesis pages
      abstract
      need for study
      problem statement
      objectives of study
      definition of terms
      assumptions
      scope and limits
      timeline
  IV Paper
    Ideas
    Abstract & Outline
    IV Proposal
  CSID/IDSA Conference
    Abstract
  Testing
    Trellis 'Garden Version'
    Garden / Usage Guidelines
  blog

Figure 28 - The knowledgebase of Trellis rendered as a list.

In response to this stimulus, research was collected on methods for interactively visualizing hierarchical systems. This search revealed many plausible options, yet no system seemed flexible enough to handle dynamic data or be embedded within a blog. Just as planning for a custom solution was beginning, a post on a freelance programmer job board unveiled an advertisement looking for developers for a flash-based radial map visualization software. A series of searches tracked down the source. When approached with the idea of Trellis and its need for a robust, flexible radial mapping solution,

Michael Douma of the Institute for Dynamic Educational Advancement offered to help, granting Trellis pre-release software, mentoring, and guidance. Much to the same way that the Page system of WordPress prevented implementing a custom hierarchical structuring algorithm, so had this software prevented the development of a custom radial mapping software - a task which would have surely taken months to plan and build.
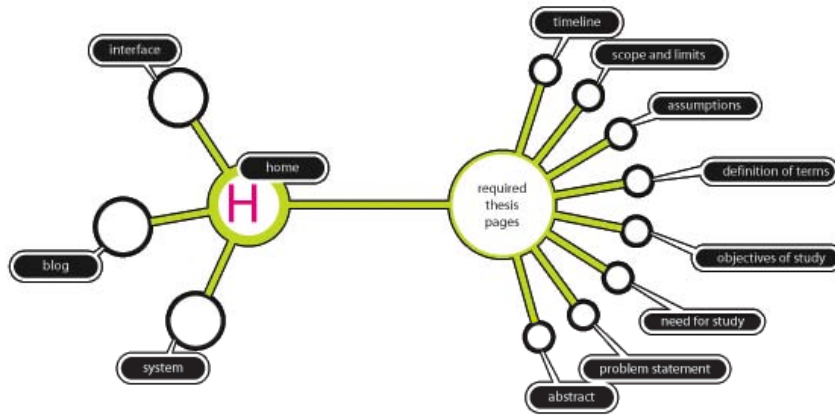

Figure 29 - A section of the Trellis knowledgebase rendered in a radial map

4.4.7 Interaction Wireframes

The following sequence depicts the sample interaction sequence of a fictional design process using Trellis. Red outlines denote user mouse clicks. The sequence begins in Figure 30, showing the blank-state of the system and the user creating a new blog post:
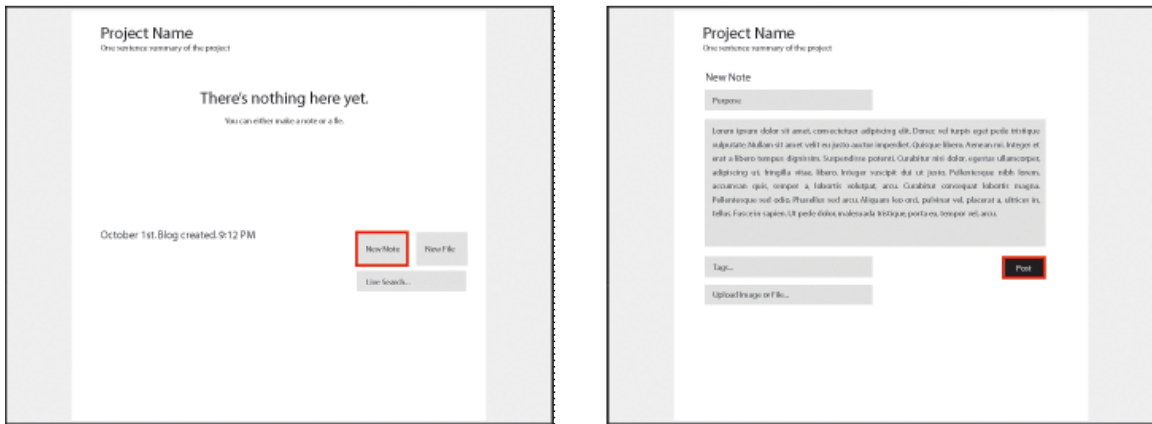
Figure 30 – Wireframe Scene 1

The new post is added and the user is returned to the dashboard, which displays the new post in the activity feed. The user then makes clicks the button to create a new knowledgebase post:

61
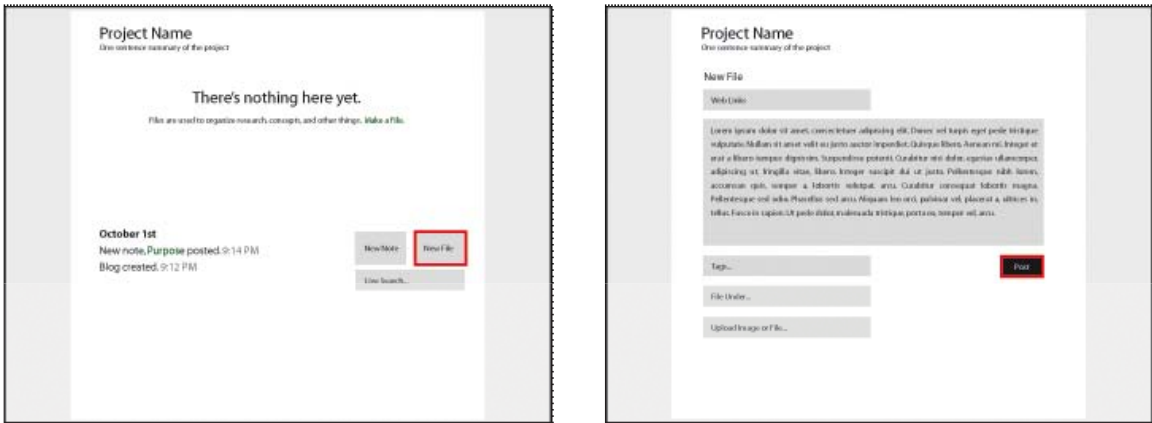
Figure 31 - Wireframe Scene 2

This new knowledgebase post pushes the radial map from its blank state. Another knowledgebase post is added and the radial map becomes larger:
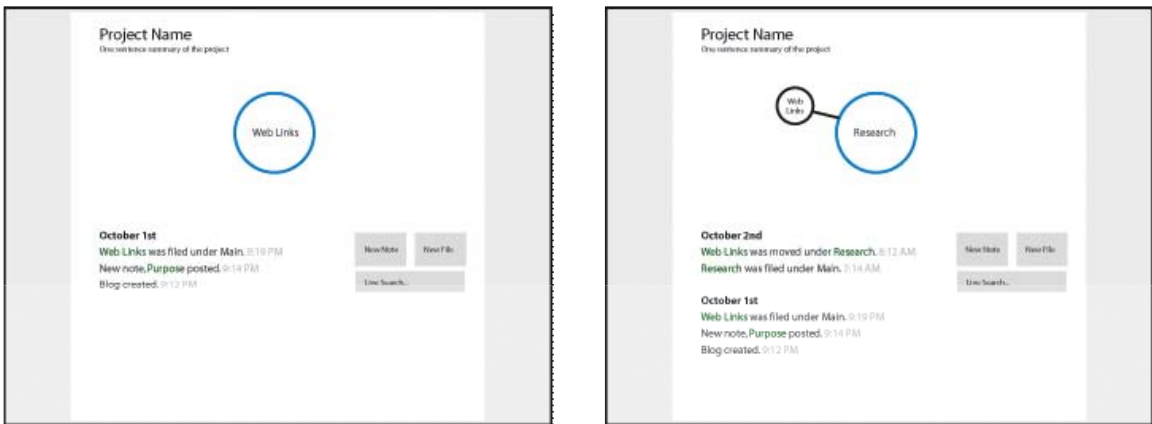
Figure 32 - Wireframe Scene 3

Figure 33 demonstrates user interaction with the hierarchical radial map. When the 'Books' item is clicked, the node's information is displayed.

Figure 33 - Wireframe Scene 4

Likewise, the map can be re-ordered as displayed below in Figure 34. As the number of nodes increases, the radial map becomes more organized and better defined:
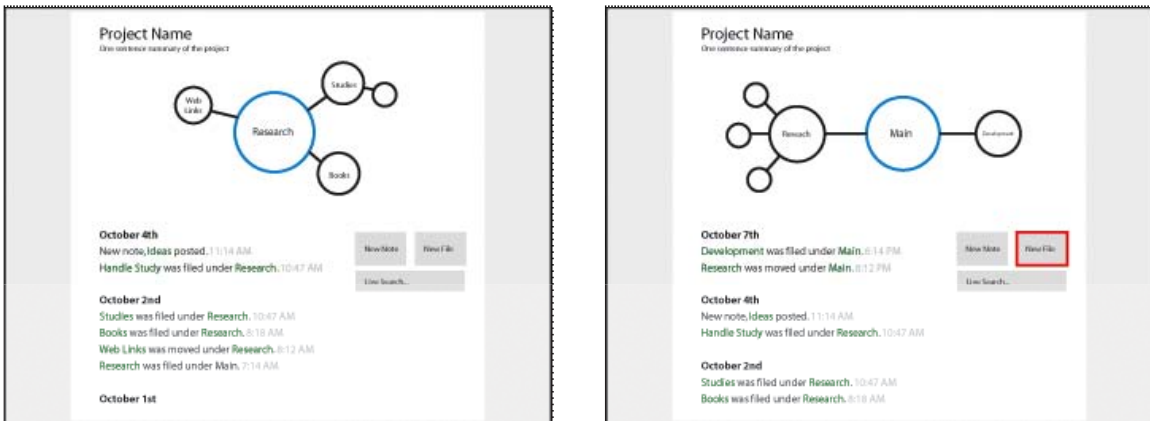
Figure 34 - Wireframe Scene 5

Figure 35 reveals how files may be uploaded and inserted into a post:
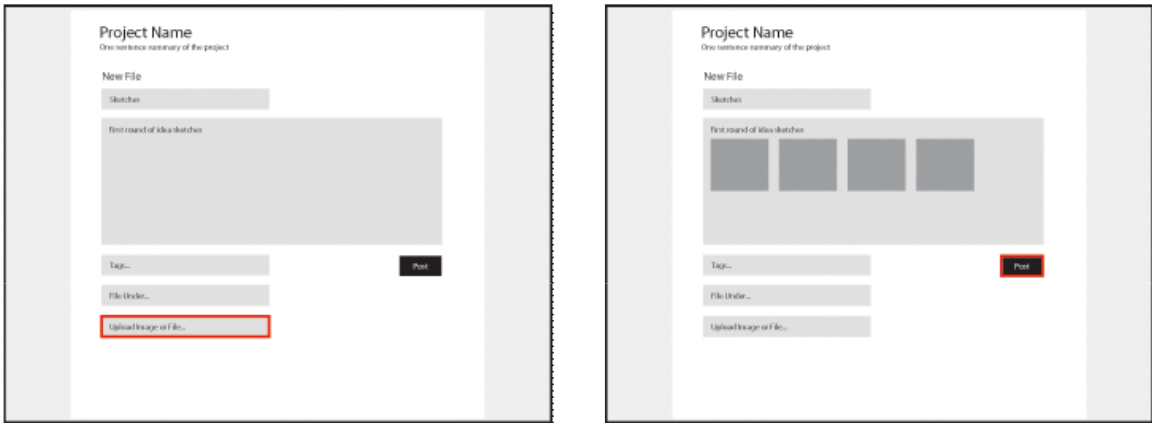
Figure 35 - Wireframe Scene 6

This new post is placed in the knowledgebase. Clicking the node representing the new post loads the images in the content area.
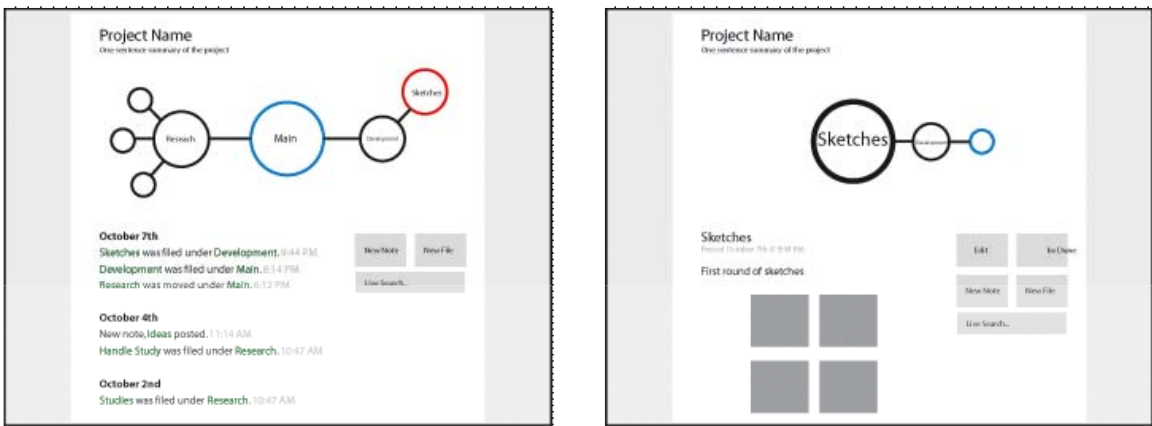
Figure 36 - Wireframe Scene 7

4.4.8 Prototypes

Figure 37 - Preprototype in development

Figure 38 – Similar layout with different mapping strategy
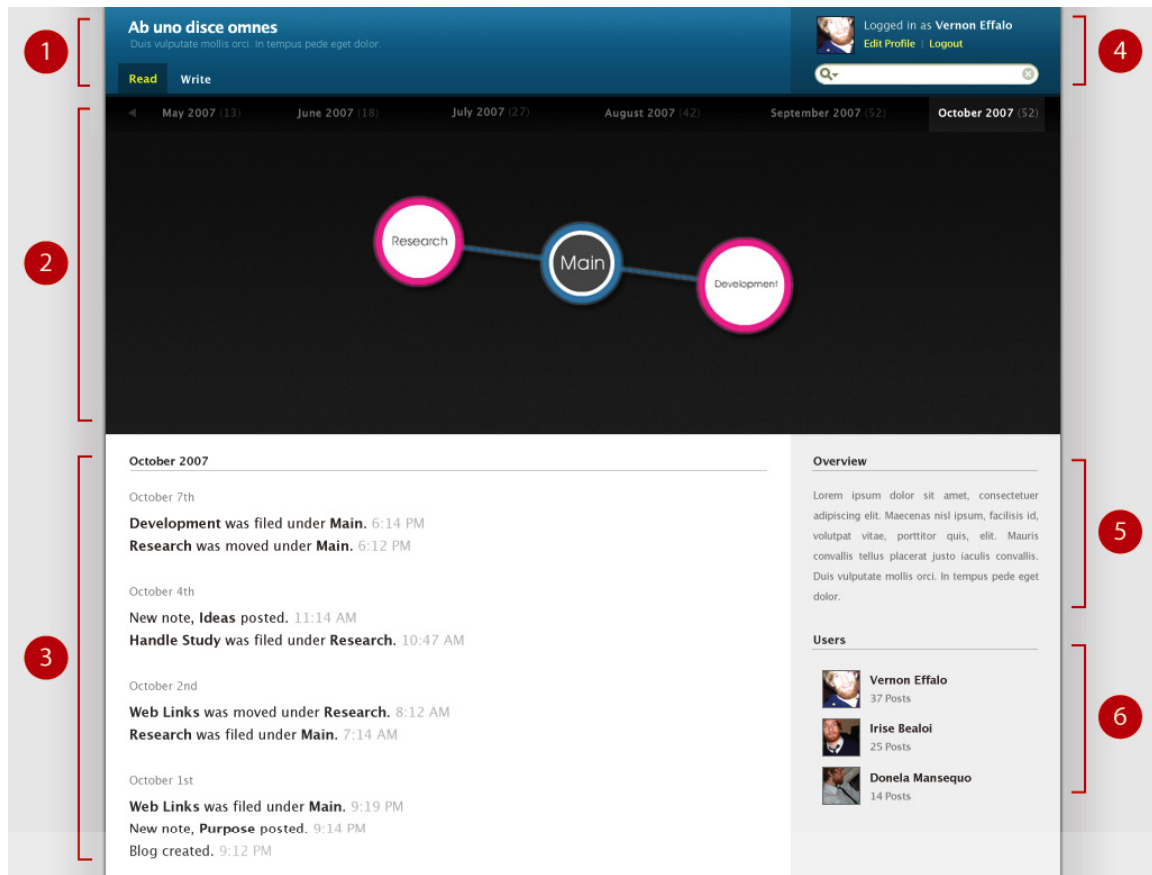
4.4.9 Final Concept

Figure 39 - Final Design Concept: Main View

Figure 39 shows the main view of the interface. The top left corner contains the title, tagline, and main navigation (1). The radial map sits below and displays the post hierarchy over an axis of time (2). Clicking on a month in the time axis will rewind or forward the blog to its respective point in time. This is visualized in the activity feed (3), which displays updates to the blog in a reverse chronological list. The top right corner contains the user management and search functions (4). To the right of the activity feed is a project overview (5) and list of active users (6).

66

Figure 40 – Final Design Concept: Viewing a Post

Figure 40 shows the read post view. The content is displayed underneath the radial map and will reveal an edit button if the user is allowed to edit the post (1). Below the content is a reverse chronological list of comments (2). Comments placed by the author of the post are highlighted in a different color (second in list), as well as comments placed by the currently logged in user (third in list). Below the list is a form for submitting comments (3). To the right of the content is post meta-information (4), tags associated with the post (5), and links to the syndication feeds for both the post and its comments (6).
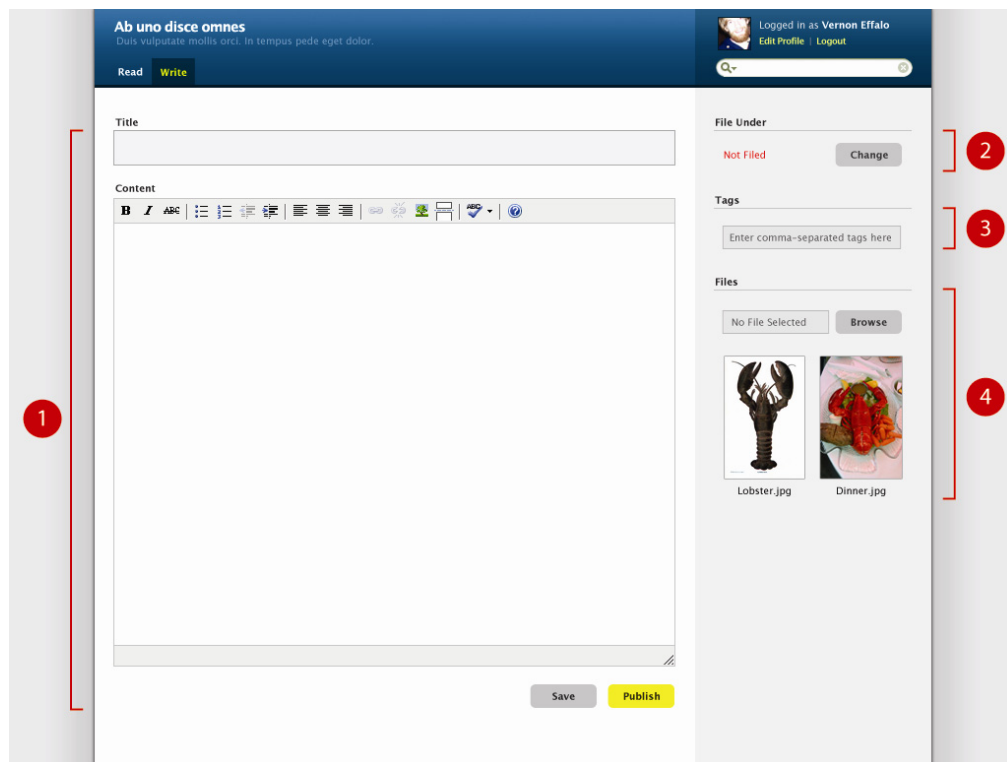

Figure 41 - Final Design Concept: Writing a Post

68

Figure 41 shows the post authoring interface. Content may be entered and formatted using the text fields in the main content display (1). To the right of the form are meta options, allowing posts to be filed (2), tagged (3), or files to be uploaded and attached to a post (4).
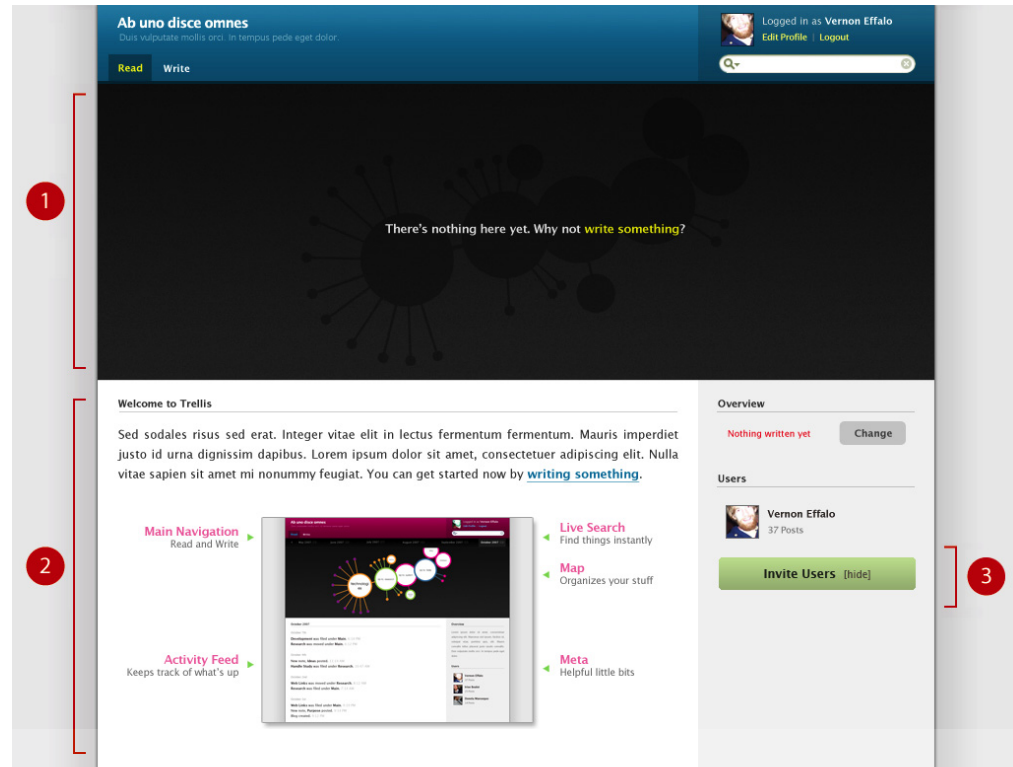
Figure 42 - Final Design Concept: Blank State

Figure 42 shows the blank state of the system. The blank state is shown when the user creates an account or when no data can be found. It educates the user as to what is to be expected, how to navigate the system, and how to get started. Since displaying the radial map is impossible without any user data, the system shows an outline of one along with a link to the writing interface (1). The content area

displays an introductory message and interface navigation tutorial (2). A brief

message also appears in the meta section, encouraging the user to invite his or

her friends and colleagues to signup.

4.5 Workflow

As Trellis is based upon a foundation of blogging, it adopts a similar workflow.

This process of posting, reviewing, sharing, and collaborating requires little

technical know-how, and integrates well into existing, more familiar workflows

and technologies.

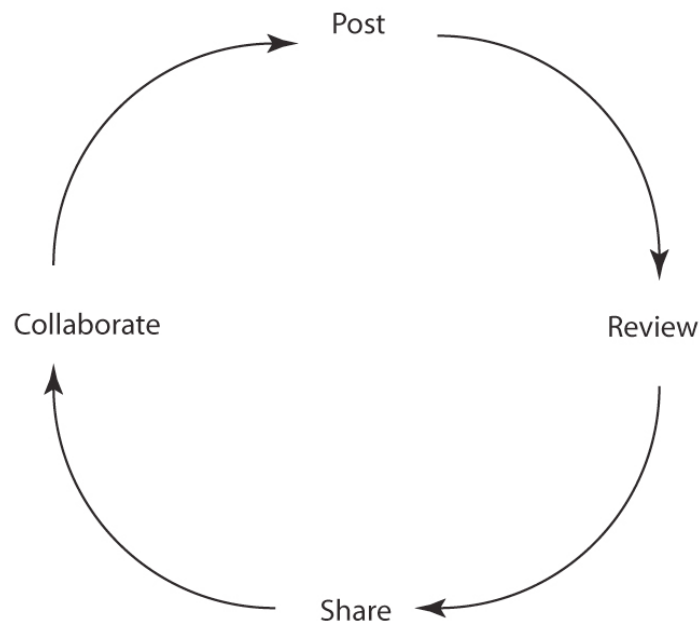**Figure 43** - The iterative idea development workflow of Trellis

4.5.1 Posting

Trellis collects knowledge in individualized units called 'Posts.' These posts

are stored either within the chronology (for ideas) or the hierarchy (for collected

information and research). Additionally, posts can be richly formatted with HTML markup and contain uploaded files.
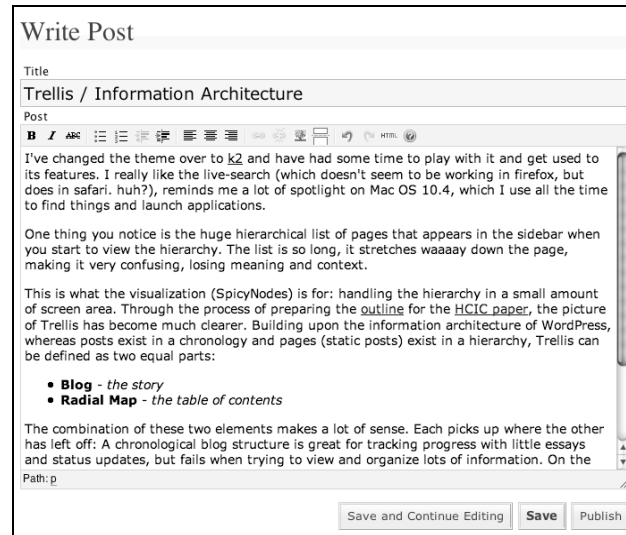
Figure 44 - The posting environment within Trellis

4.5.2 Reviewing

Trellis retools the typical blog layout to provide an immersive environment, well suited for the description and analysis of ideas. This is facilitated in part by a radial map, which visualizes the contents of the hierarchical knowledgebase. The chronology is displayed in the typical reverse-chronological format, showing additions to both the blog and knowledgebase over a common axis of time. This 'feed-like' display acts as a historical record of development, where progress can be reviewed, over time. Also during the review process, posts can be edited or moved about within the hierarchy by clicking the

'Edit' link, shown next to each post. The 'Activity Feed' is illustrated below, which

shows two, more recently published hierarchy items above an earlier added blog

post:

Figure 45 - The Activity Feed

4.5.3 Sharing

Posts can be shared via syndication, which broadcasts updates to the

chronology and hierarchy to those interested in the development process. Each

post is also assigned a *permalink* (<u>perma</u>nent link), that can then be sent to a

friend or colleague. Permalinks provide an easy way to reference an individual

post, as they may eventually get cycled out of the front-page chronology as time

elapses.

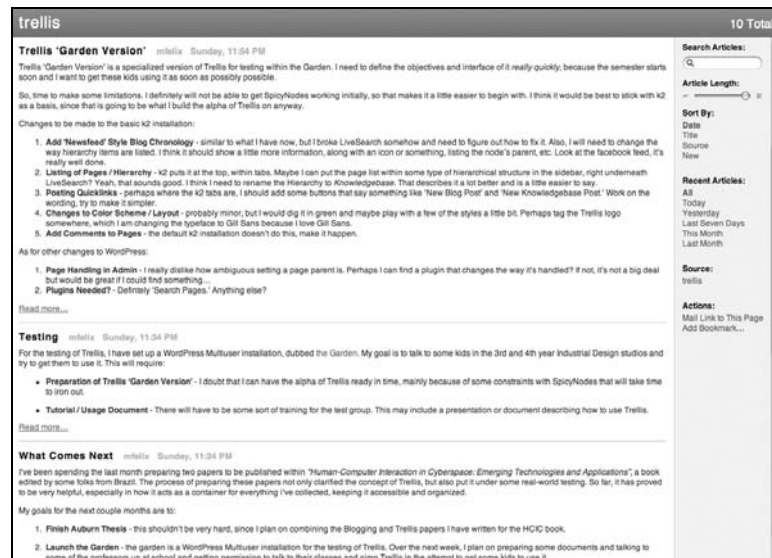**Figure 46** - Viewing a blog via a newsreader

4.5.4 Collaborating

Building upon the commenting systems native to most blogs, Trellis

enables collaboration by allowing comments to be collected on both chronology

and hierarchy items. These comments are stored within the context of the

content, and can, in turn, be syndicated to remotely inform those interested of a

conversation on a particular post.

Figure 47 - Commenting on a Post

4.6 Implementation

Building upon its foundation, Trellis acts as a middle layer between the user and the blogging system. This relationship gives Trellis access to the actions and methods of its parent blogging system, and re-purposes its use. Another advantage of this 'inherent implementation' is feature cascading. With each new release of WordPress, its features become inherited through Trellis. This dynamic ability keeps Trellis focused on its task, leaving the lower-level processes to be handled by the blogging system. Such an open approach also helps Trellis scale and adapt to future advances in blogging.

Rather than being written from scratch, Trellis is implemented as a synthesis of several open source tools. A large portion of its code-base belongs to another open source project for WordPress, called k2. k2 is a theme that offers several dynamic interface elements, most notably *LiveSearch*, a method for displaying search results without refreshing the page and *Rolling Archives*, a similar method for going 'back in time' within the blog, again without requiring a hard refresh of the page. Building upon this functionality, Trellis is able to handle

74

the dynamic interaction of the radial map and the blog interface without having to write a completely custom solution.

4.6.1 A Virtual Space

Building upon how blogging establishes a virtual space for global information publication and exchange, Trellis extends this space into two connected environments for collaboration and organization. The collaborative features of blogging facilitate an environment where feedback can more easily be shared within the context of the content, keeping the discussion focused and overall more relevant. This space is extended through syndication, which allows the information to be shared in a variety of standardized formats, making the process much more adaptable to future changes in web technology.

The organizational space provided by Trellis aids in the rapid development of ideas by simplifying the process of sorting and visualizing information. Being based on both a hierarchy and chronology, Trellis extends the organizational space with the added element of time, facilitating a historical record of progress. These two spaces of collaboration and organization combine to form a multidimensional virtual environment, well suited for the generation of ideas. Such an approach would be difficult to implement within a non-virtual environment, as the combination of blogging, radial mapping, and the Internet within a physical realm (like paper) would be cumbersome, if not nearly impossible to comprehend and maintain.

4.7 Delivery

Trellis is to be delivered as a hosted service aimed at both individual designers and creative teams. A hosted service runs on a remotely managed system, from which users may purchase a subscription. The advantage of this approach is that users have to install no local hardware or software, and requires only a semi-modern web browser and decent Internet connection. These subscriptions are to be available in different service tiers, outlined below:

- **Free** – A free account for users to try out and decide if they feel the service is worth purchasing. This approach is inline with many hosted web services available. The free account will offer little upload space for files and be ineligible for customer support. It would also be limited to documenting a single idea or project.
- **Personal** – A service tier suitable for use by an individual. Provides an ample amount of storage space for tracking up to 100 projects or ideas. Should the user need more space or projects, they will be offered an upgrade to the advanced plan at a reduced cost.
- **Advanced** – The highest tier of service, offering a large amount of storage space and the ability to create and document an unlimited number of ideas.

The hosted service will run off of WordPress Mu, the multi-user version of WordPress. WordPress Mu is similar to the standalone version of WordPress in how it manages blogs, yet it adds the ability to create an unlimited number of blogs and users through a single install. All of the plug-ins available for standalone WordPress also work on the multi-user version, making client customization easier to implement.

Figure 48 - Marketing and Service Portal

4.7.1 Enterprise

Trellis will also deliver an enterprise-level software component. This software could be installed upon an existing application server and customized to meet a client's specifications. The enterprise approach offers a more flexible hardware setup and local data security at the cost of a simple setup and installation procedure. Because it requires no special client-side software, implementation throughout the enterprise is much easier than locally-hosted knowledgebase solutions.

4.8 Testing

One of the difficulties encountered with the recursive design methodology shaping Trellis was how to make the system adaptable to the methods of others. A working model of Trellis was developed for interface and methodology testing. At the time of this test, the radial mapping technology provided by the SpicyNodes team was not yet embeddable within external applications like Trellis. For the purposes of the testing exercise, a simple hierarchical list was used.
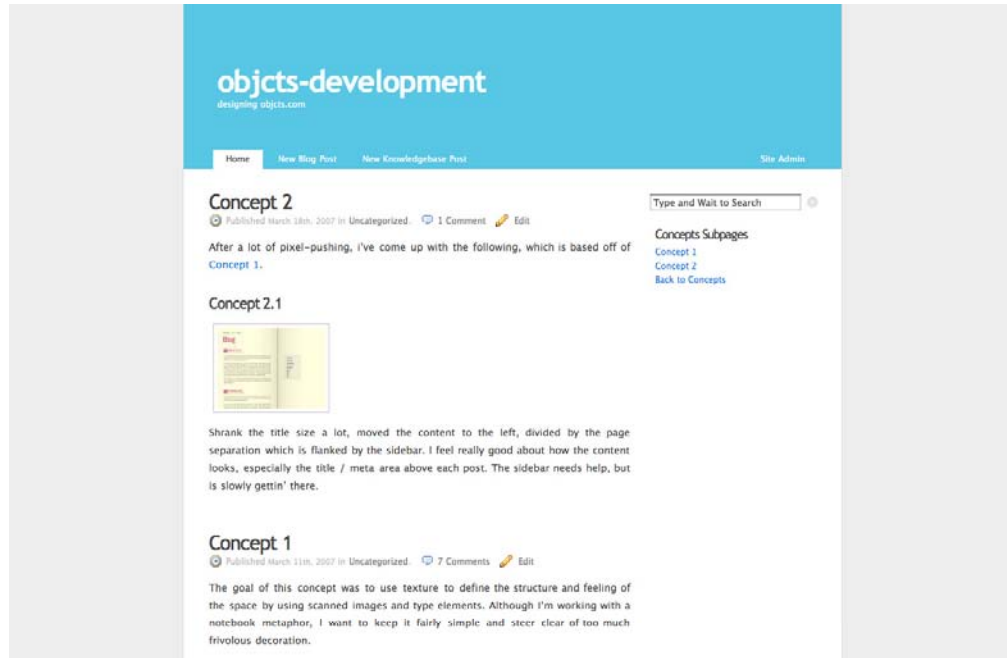
Figure 49 - A project being developed in the Trellis testbed

Students of the Industrial Design program at Auburn University were invited to use this system for developing and documenting their studio projects. At the time of writing, over 15 students have registered over 30 blogs, with several of them still being actively used. Much of this testing is still underway, yet it has already revealed several trends.

The current testing implementation continuity proves to be too complicated for most users. The posting process is overwhelming for those unfamiliar with the blogging process. These initial findings have necessitated a simpler posting environment and condensed menu structure. The interface is key in the successful workflow integration of Trellis the idea development process.

79

4.9 Strengths

One of the greatest advantages provided by Trellis is its ability to centralize ideation. By acting as both a scaffold and a container, it can store not only the thoughts related to a developing idea, but also a comprehensive knowledgebase of directly relevant information. Building upon its blog foundation, this information can be easily organized, searched, and syndicated. A supplemental benefit offered by blogging is its chronological nature, which allows Trellis to generate a historical record of idea development.

The informal tone of blogging can be seen as a benefit when applied toward idea management. Documentation may often be considered a chore, but by breaking the process down a stream of smaller bits of information, it is considerably easier to approach. Whereas a typical blog's audience is global, Trellis suggests that users attempt to make themselves their own audience. This can help to overcome writing anxiety by providing a connected, yet privatized virtual environment for the development of ideas.

Many emerging technologies can limit themselves by not providing standardized interfaces for communicating with other applications. Such is not the case for Trellis, as it is built upon an open-source platform that offers a multitude of procedures for displaying and sharing the information it contains. This open approach has other benefits, as Trellis can exist as a methodology, not tied to any explicit implementation. Users are not only allowed but also

encouraged to define their own rules and adapt the system to suit their needs, while Trellis simply provides a scaffold for the development process.

4.10 Weaknesses

Trellis' approach to idea development relies upon the user adopting a blog-like procedure of recording information. Often times this procedure may seem like more a hindrance than help, as the structure provided by Trellis is not as flexible as a blank sheet of paper. Because ideation may come in bursts, the act of blogging may get in the way of making quantifiable progress. Technical obstacles also exist, a prime example being waiting for large files to upload or simply not having access to the Internet.

Just as blogging is an emerging technology, the process of adapting it toward a new context can generate interruptions in familiar workflow. This is evident as email has become a standardized form of remote communication, and attempting to coerce users into commenting on a blog post rather than sending an email may seem unnatural. The methodology may also prove to be uncomfortable for those more accustomed to working with physical media, as Trellis exists within a virtual environment.

V. APPLICATIONS

Trellis' approach toward idea development promotes its adaptability to a wide array of different applications. Following are several examples that demonstrate its potential usage.

5.1 Developing a Project

An industrial design student is taking a product design studio class. In some initial research, she finds some useful, albeit broad information on the Internet. Within Trellis, she creates a post called 'Research,' under which she posts summaries of the information found, along with pictures and links. These posts are added to the hierarchy, which is visualized and explored with a radial map. Each post is demarked with tags and placed in categories to organize and maintain the content. As more information is collected, the hierarchy grows and eventually evolves, as more is learned about the subject.
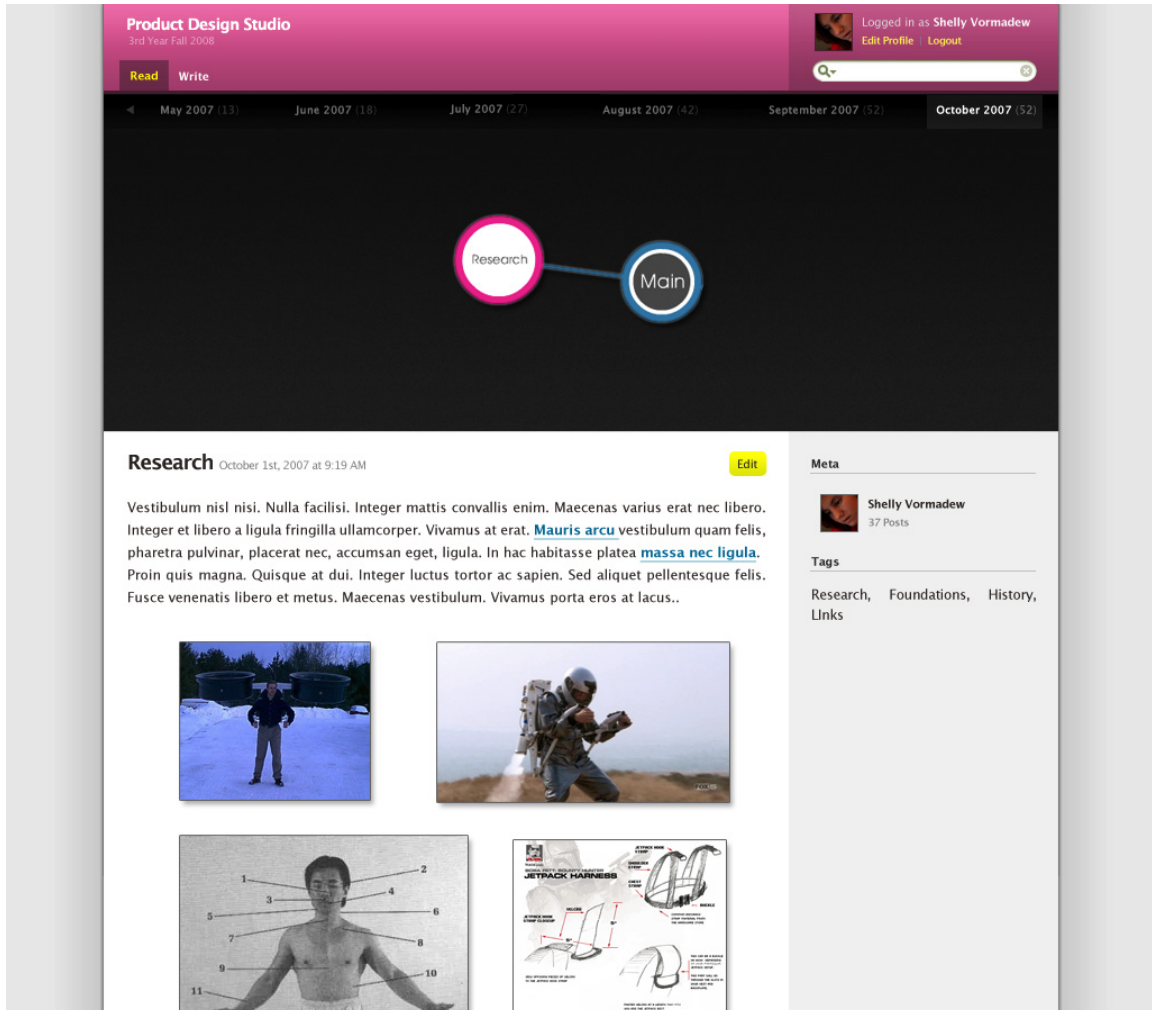
Figure 50 - Collecting research

Once she is knowledgeable on the subject, she starts to define design objectives within posts to the development blog, based on the knowledgebase she has compiled. Soon she is ready to begin drawing concept sketches, which she scans and uploads to the blog within several posts. She sends a link to these posts to her friends and mentors, who leave feedback and criticism through the blog's commenting system. During the rest of the design phase, Trellis is used as a

documentation tool, outlining the development of these sketches into a final concept.
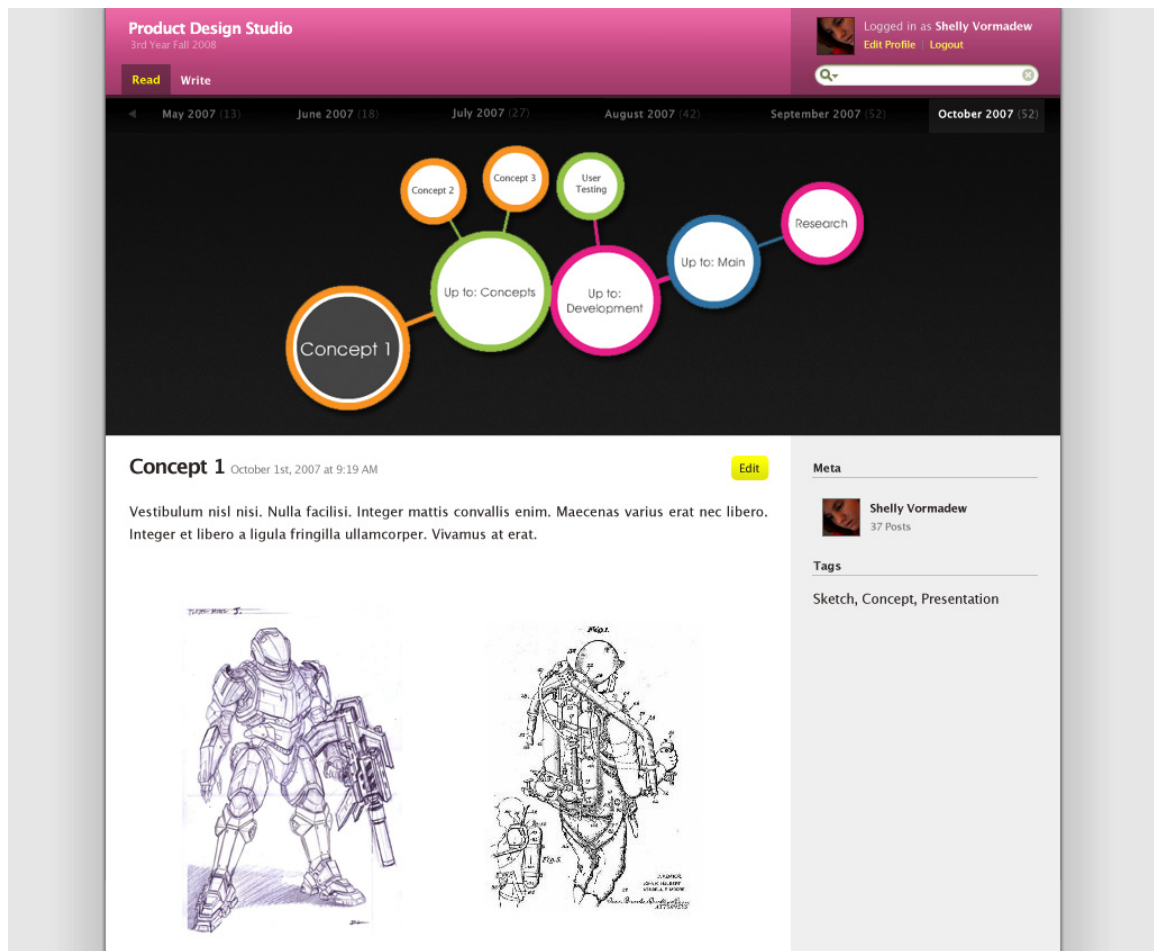

Figure 51 - Posting Concept Sketches

Months later, she begins the search for a design job. She develops an online portfolio and adds links to all of her studio project blogs. Potential employers are given insight to her research methodologies and creative design process, making it much easier to decide how she would fit into their team.

84

5.2 Collaborating on a Creative Project

While at lunch, two friends decide to collaborate on a book. That afternoon, a new Trellis is created and a summary of their conversation is posted within the development blog. This post is continually commented on and revised until a more solid definition of their goal has been developed. Over the next few weeks, they collect and organize their research within the hierarchy.

Figure 52 - Organizing Plotlines

Soon the hierarchy grows to a fully indexed tree of information and it has become time to outline the structure of the book. A sample outline is prepared within a new blog post, and through the comments, a master outline is created. This outline is translated into a new branch within the hierarchy called 'Book Outline.' Inside this branch, they store and update the copy and page layouts inside blog posts until it is edited and ready for production.

5.3 Managing a Group

A manager is in charge of a team of designers who are developing a new identity for a large corporation. He makes a new instance of Trellis and creates accounts for everyone on his team. Within the hierarchy, a structure is formed for both storing and organizing color studies, sketches, and concepts. As the team updates the development blog with progress, it is broadcast to his boss and the Chief of Marketing through newsfeed syndication. Eventually the ideas become more concrete and a concept is chosen and developed. As more designers are added to the project, they are quickly brought 'up to speed' by reviewing the information contained within the project blog.

5.4 Organizing Output

A multimedia artist finds it difficult to keep up with all of his output, especially when a single project may involve many different media types. Trellis is used to organize his work, creating branches within the hierarchy for his individual projects and ideas. By using the organizational features of Trellis, he's

able to better organize his posts with labels like 'sketch,' 'poem,' or 'song.' His

entire body of creative output can be searched and filtered, becoming an

interactive, multimedia sketchbook.

VI. Conclusion

The process of researching knowledge and developing Trellis has led to understanding idea development as a recursive process. Ideas are the result of new knowledge, developed upon the formalization of previous knowledge. Mark Twain more eloquently describes this concept:

"There is no such thing as a new idea. It is impossible. We simply take a lot of old ideas and put them into a sort of mental kaleidoscope. We give them a turn and they make new and curious combinations. We keep on turning and making new combinations indefinitely; but they are the same old pieces of colored glass that have been in use through all the ages. [34]"

Just as Trellis proposes a new method of knowledge management, it is by no means a new idea. Trellis relies upon its foundations of blogging and radial mapping, from which exists an even larger base of knowledge. This recursive design forms sustainable, self-documenting systems that help to guide the development of evolving ideas.

6.1 Blogging for Ideas

The blog that tracked the development of this thesis project became a valuable resource in the writing of this document. The knowledgebase was used to collect research, from which an outline was drafted and posted on the blog. Through comments, this outline was modified and finally formalized with the help of several collaborators. As drafts were completed, they were posted to the blog, and these updates broadcast themselves via syndication to all of those involved in the project.

Being centralized on the Internet, the blog could be accessed anywhere a connection was available. This allowed the author to work at remote locations, yet still have access to the large knowledgebase of compiled information. This ability also provided a foundation for collaboration between the author and Mr. Douma, which proved especially helpful during the initial stages of writing.

As the information architecture (IA) of Trellis became better defined, it moved virtual locations. The first version was hosted at `trellis.heavyobjects.com`, moving several times in the same domain until becoming formalized at `dev.mytrellis.com`. A better initial IA could have prevented this mobility, but at that time the scope of Trellis had not yet been realized.

6.2 Further Research

This paper investigated the application of blogging for the management of the idea development process and developed a concept interface for user

interaction. Testing of the concept was difficult, as the radial mapping technology necessitated by Trellis was not yet fully implemented. Further research could pursue the development of this concept into a working model and conduct more user research and case studies. More investigation could also be done into different mapping strategies for the knowledgebase, and how this visualization may be more deeply integrated into the interface.

Additional research into the development of a sustainable content taxonomy could be performed. The user could be presented with a set of procedures for the management of their ideas based on different personal or situational preferences. This research could also examine an adaptive approach, which would evolve in complexity or structure as the scaffold grows.

The author intends on continuing this research post-graduation. The `mytrellis.com` domain has been reserved further research and possibly for hosting the commercial product, should the concept prove marketable.

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