



Kahn + Associates visualizing information architecture

THE VALUE OF CONNECTIONS

Paul Kahn, Kahn+Associates

paul.kahn@kahnplus.com

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I. IMAGINARY MACHINES

The greatest value of the World Wide Web is having access to the information you need, when you need it, from a single source – your own computer connected to the Internet. That information is the Public Web, the billions of web pages we can reach from the computer in our office, our home, or a convenient public location. The content is the gift of others, the digitized texts, images, sounds, films and videos connected by a network of links and search indexes.

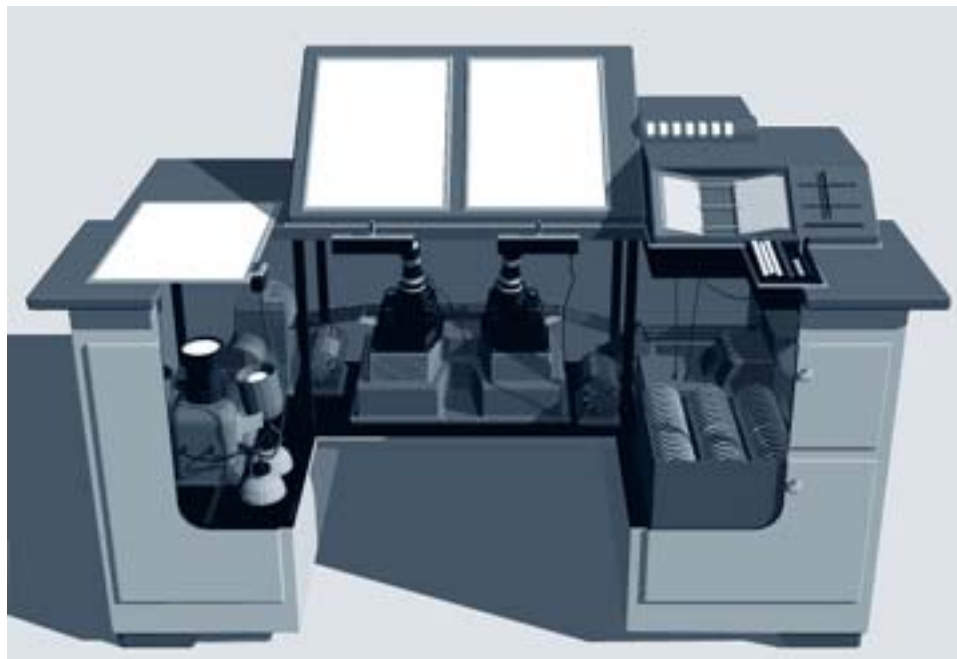
One of the early inspirations for the concept of hypertext was “As We May Think”, an essay by Vannevar Bush. Bush was an engineer, inventor of analog computers and medical devices, a leading professor and administrator at Massachusetts Institute of Technology and the U.S. government. This essay, published in August 1945, envisioned ways in which machines would help the scientist and engineer extend his capacity to record information, recall data, and solve complex problems. There were three machines described in this essay.

One was a “vocoder”, a machine that would turn speech into text, solving the mechanical problem of keyboards. While Bush’s imaginary machine was based on a demonstration that had taken place at the 1939 World’s Fair in New York, most of us who work with computers still type our text. Speech is one of the most fundamental aspects of human culture, but turning arbitrary spoken communication into coherent and accurate electronic text remains a problem that has not been solved.

A second idea was a head-mounted camera, pictured as a kind of third eye. This device would allow a scientist to capture images of the work in his laboratory without having to move his hands away from his work. Such a device can be built today, but the inclusion of digital cameras in other devices may make this prediction unnecessary. Today, telephone manufacturers give us a digital camera in our mobile phone, while telephone operators hope to generate revenue by encouraging us to send the images around.

The third idea was the one that inspired many computer scientists and arguably gave us the first vision of the Web we have today. This was the “memex”, and invented word meant to evoke “memory extender”. This was a device the size of a desk which contained a complete library in miniature form. The desk had two screens for viewing pages side by side, and a keyboard for

commanding the display. A copier was included to add documents, and a stylus for annotating the images on the screens. The library in the desk was personalized, not only by annotations but most importantly by trails made by the memex reader.



Memex re-creation, designer : Ian Adelman

These trails of association, created by the reader, could be recorded, saved, and recalled through the machine. They could even, Bush imagined, be shared with other memex users. In the essay he describes an interesting trail – the history of the Turkish bow – which he could send to a colleague as part of a discussion.

The example Bush chose had personal associations. He had spent a frustrating time in the US military during the First World War trying to apply his talents to improving weapons systems. Nothing came of his work – nothing moved from the laboratory to the field. But during the Second World War he was the director of the Office of Scientific Research and Development, advising President Franklin Roosevelt and overseeing weapons research for the Army – radar, the proximity fuse, the atomic bomb. During his post-war career, he was the moving force behind the creation of the National Science Foundation, which became the main funding agency for scientific research in the US.

This imaginary memory machine would make sure that important research would not be “lost” in the impersonal stacks of libraries. The associations of the educated mind would be recorded in these trails that could be shared with other educated minds.

Today it does not matter to anyone who reads the essay that its author was thinking about the technology of the 1930s – analog computers, microfilm, and photo-mechanical selectors. It was also unimportant that many details of the thought machine he imagined went undescribed. The idea of building trails is recognizably human – we all do it without machines – and the hope that we could share our own trails, and benefit from the trails of others is a desirable goal.

II. LOOS CONNECTIONS

Sometimes it is amazing what you can find on the Public Web. I was recently preparing for a lecture and decided to look for information about Adolf Loos, the influential Czech-Austrian architect and designer. My attention had been drawn to Loos by the stone plaque fixed to the outside of a building on my street.



Maison Tristan Tzara plaque, photo: Laurent Kling

When I first saw the plaque I had heard of Tzara, the Rumanian-born poet who created Dada literature in Zurich and then moved to Surrealist Paris – I had an English translation of his poems on my bookshelf – but I knew little about Loos. A friend had once pointed out to me Loos’ essay “Ornament and Crime”. I had seen some Loos chairs in a museum in Vienna. Now I was living near what I soon discovered was the only one of his buildings to be realized in Paris. So as I sat at the computer in my apartment, beside a window looking down at the corner of avenue Junot and rue Simon-Dereure, I thought I would see what I could find on the Web.



avenue Junot, photo: Laurent Kling

Where do we begin such a search? What “code” do we type into the machine to retrieve the information? I began with the web address of Google, which is today the most comprehensive and effective search index. First, I was faced with the problem of orthography. Search programs, like all software, rarely know what you mean, they only know what you type. Google is better than most, offering correct spelling when we mis-type a word. But in this case, am I looking for “Adolf” or “Adolph”, both of which are theoretically correct? I began with “Adolph” and found an image of the Loos portrait painted by Oskar

Kokoschka. This was a false promise, a painting of an architect but no link to his architecture or any other information about the subject of the painting. I corrected myself with “Adolf” and found much more.

The fact that a search index such as Google cannot bring together information about a single person represented by various spellings is an example of the lack of an Authority List on the Web. An Authority List is a common practice in library science, the creation of cross-references among the possible variations of the name of a single author. Because of this, a search in a library catalog for the works of “Thomas Sterns Eliot” will find T.S. Eliot, “Samuel Clemens” will locate the writing of Mark Twain, and “Sami Rosenstock” will find Tristan Tzara.

By typing “Adolf Loos” I found a link to a promising website: ArtandCulture.com. This proved to be a useful collection of short essays and useful links concerning artists, architects, photographers, writers, and designers, the altruistic creation of some web design benefactors of the late Dot-Com boom. The influences and relations of the artists were presented in a network, making it easy to see one editor’s version of Loos’ context in architecture and design. If I had started with Oskar Kokoschka here I would have been led to the essay about the man he was painting. And this introductory essay on the life and work of Loos, followed by a selection of online resources including the “Konstantin Melnikov database by AGRAM”.

But the link did not work. It brought me to a “page not found” message on the university website. Here I had to rely on my own computer experience, removing portions of the link address until I found the database. So the information was there, but not at the end of the link. Why?

In fact, ArtandCulture.com was a Web ghost town, an abandoned project – like many ghosts it has since disappeared. Between the time the editor made the link and the time I followed it, the AGRAM database had been moved. There is no universal link registry to address this kind of problem. In this case, the loss was not significant – I found the database another way. But in the online scientific literature, with billions of references among scientific articles, such a loss can be very serious. If I am researching a medical procedure and follow a link to a critical article, I do not want to learn that it is unavailable because the web page has been moved or the publisher absorbed by a merger. To address this problem, the Digital Object Identifier System has been created for “identifying and exchanging intellectual property in the digital environment”.

The service allows publishers to register each article with a unique DOI number, and place the current location of the article in the DOI registry. This system of indirect addressing is used to maintain the integrity of links over time.

Back to my search, I was looking at the AGRAM Database, a fascinating collection of information on buildings designed by major architects of the early 20th century, Adolf Loos among them. This was created by Rein Saariste sometime before 1997 and remains on the web server of the Technische Universiteit Delft, though it cannot be reached by any links from the TU Delft website.

Within the AGRAM database, I found a complete list of all the buildings designed by Loos, along with dates, locations, photographs and floor plans. By sorting the buildings by year of design, I found the other buildings Loos was working on during his years in Paris. Clicking on the “Rosenberg” building, I found myself reading about a house that was planned for the very spot I was gazing at from my window!



current building, photo: Laurent Kling; Rosenberg building model, R. Saariste

It was a remarkable Internet Moment. I moved my eyes from the photograph of the architectural model Saariste had made from Loos’ drawings on my computer screen to the building that now stood across the street. I could not ask the Web: *What can you tell me about the corner of avenue Junot and rue Simon-Dereure in the 18th arrondissement of Paris?* The Web could not reply: *I can show you an image of the building that was designed to be on this corner 90 years ago but was never built.* Yet, through a fragile trail of associations, I had found just that.

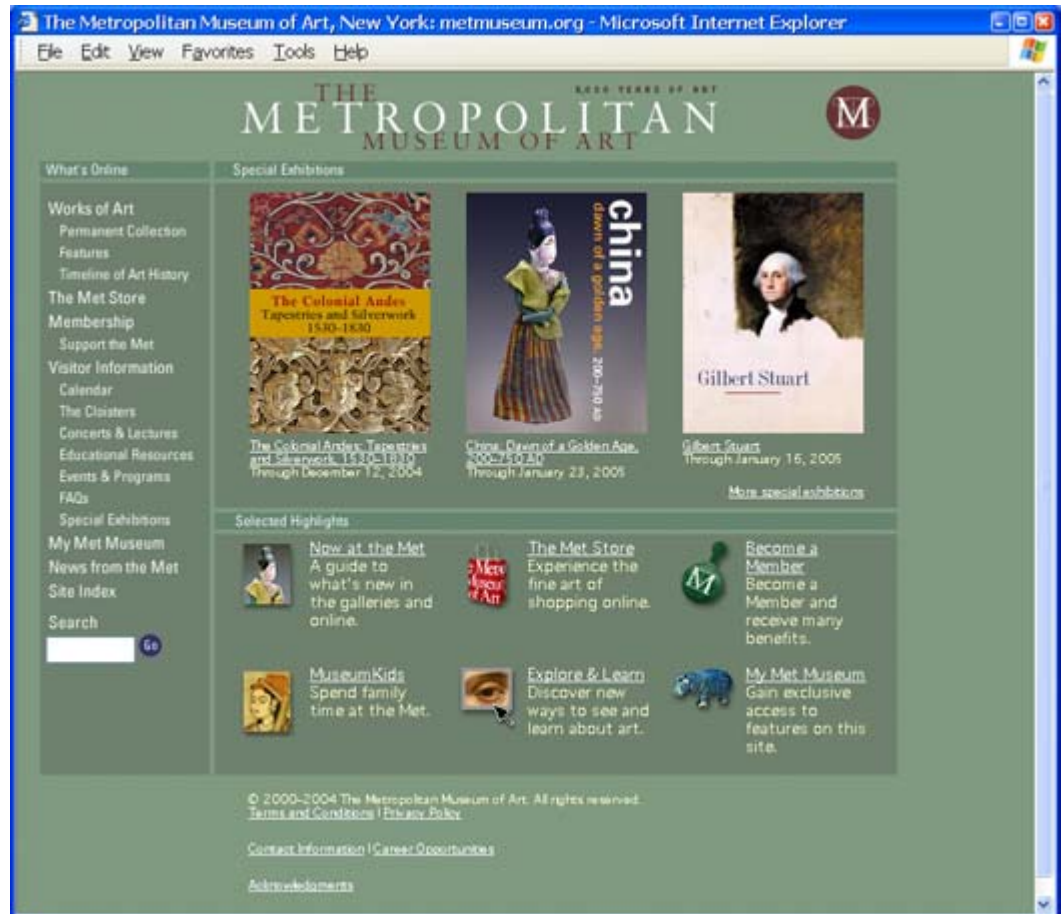
III. DESIGNING CONNECTIONS IN THE MATRIX MUSEUM

When I have these kinds of experiences, I am reminded of the value of connections. The great value of the Web is not simply that we find things. It is that the things we find are linked, drawn together by navigational associations we can choose to follow. Yet, as we move information into digital form we often leave the most obviously connected things in isolation. The problem is not limited to the websites created by individual authors in different parts of the world. The lack of connection is to be found in the websites of many large enterprises and institutions where the absence of thoughtful information architecture permits related items to hide in unconnected information spaces.

A compelling example is the website of the **Metropolitan Museum of Art** (Met) in New York. I choose The Met as an example because it is one of the world's great art museums, and its website is also an example of an Enterprise Web Space. In this site we find examples of excellence on all fronts – design, information architecture, usability, content development – as well as examples where related information remains unconnected.

I use the word “enterprise” to mean a large, complex institution. In business, “enterprise” denotes a large company, with many locations and divisions. Whether we are talking about a large museum with many departments and locations or a multi-national corporation with many product lines and regional markets, the problem is the same. The Enterprise Web Space consists of all digital assets of an organization accessible through the Internet, both public and private. All digital assets includes websites, application programs, content collections, bulletin boards – everything that can be reached through a web browser. Each part of the Enterprise Web Space is often managed by separate groups, under separate budgets and administration. But to consider such a complex of digital assets as a website or a group of websites is a mistake. The Enterprise Web Space is part of a larger structure defined by the user's frame of reference. When viewing a museum site, the user may be looking for information about a special exhibition, a publication, a favorite painting, an educational resource, an insight into a period of art history, in any combination. For the user, all these different kinds of information are coming from one information space. While the Met can be reached from a single home page, it consist of many websites, databases, e-commerce servers and image collections, each run by different departments for different purposes. To make this collection useful, we must design the appropriate Enterprise

information architecture. This means defining the appropriate user-centered divisions and then creating the right connections between them.



www.metmuseum.org home page

The home page of the Met website presents several forms of organization in parallel. On the left, we have a hierarchical list with sections: Works of Art, Met Store, Membership, Visitor Information, My Met Museum (a personalization feature), and News. The top center has places for three current exhibitions. The bottom center is divided into six places, repeating four items that also appear in the list on the left, and introducing MuseumKids (for children and family exploration) and Explore & Learn (for art education resources).

If we think of the Met as a collection of art, we can start from the Collections. Here we are presented with the museum’s departments, an organization that is critical to the institution itself but of less importance to the user of the

website. If we select Features, the art of the world is unified once again, and we are give choices of featured works, recent acquisitions, and virtual tours, as well as educational features.



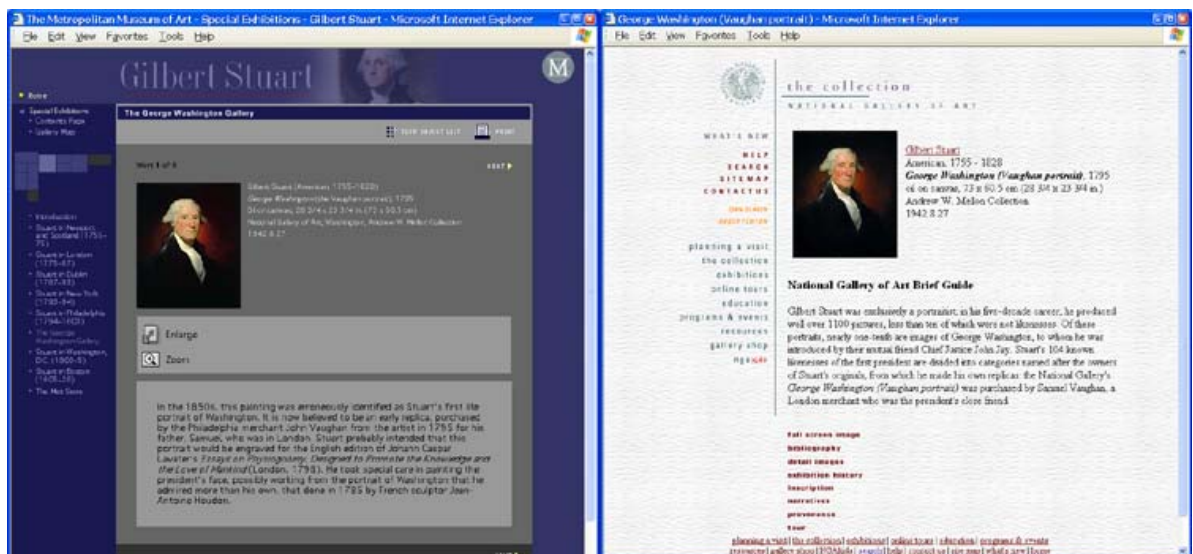
American Painting and Sculpture Features page

Useful information appears once we select a department, such as American Painting and Sculpture. Here we are connected to collection highlights, the entire collections database, an introduction essay, a map of the gallery locations, a list of publications, and a Features and Exhibitions. In Features and Exhibitions we find a wealth of connections: links to special topics in the Timeline of Art History, exhibitions currently on view, special websites made

for related exhibitions, and information about past exhibitions still available online.

The current exhibition on the 18th century American painter Gilbert Stuart has its own website, which presents images of the exhibition organized by room, which themselves are organized by theme. We can select an individual work, such as the Vaughan portrait of George Washington, and view a brief description. But in this view there are no connections to be found outside the context of the exhibition itself. The same failing is true in any view of an art object through the Collection view. Each work of art is a terminal node, an end-point in a trail. There is no technical reason for this – it is a matter of design and attitude.

The Vaughan portrait we have selected is on loan from the National Gallery in Washington, and we can find it on the website of that museum with a different presentation. The **National Gallery of Washington** website is another enormous Enterprise Web Space, with its own great strengths and weaknesses. One of its strengths is how they have integrated the view of a work of art and their extensive collection-management database. Our view of each painting is linked to every piece of information about the object, including description, bibliography, exhibition history, and narratives from tours of related paintings. Most importantly, the name of the artist is linked to a list of all the artist's work, a simple and useful connection. Presumably, the collection management system has an authority list, so touching the artist's name is a one-click search that gives us a list of all his works.



Met object view, NGA object view

If we return to Works of Art at the Met and choose the Timeline of Art History, we discover an enormous website organized along time periods (20,000 B.C. to the present) and the geographical regions of the world. Here the connections are fundamental to the intention of the work itself, as the Timeline is an encyclopedia of art history aimed at a general audience. The page on Gilbert Stuart presents a selection of paintings, an essay with links to other artists and themes. Beneath the Related Timeline Content menu is a full list of other timelines, topics, and maps. In the right column are connections to educational materials in the Explore & Learn website, as well as links to several special exhibitions, including the exhibition we have viewed.

Met Special Topics Page | Gilbert Stuart, 1755-1828 - Microsoft Internet Explorer

Address: http://www.metmuseum.org/toah/hd/stua/hd_stua.htm

Timeline Search Site Map Index Special Topics

Timeline Home

Related Timeline Content

Gilbert Stuart (1755-1828)

The most successful and resourceful portraitist of America's early national period, Gilbert Stuart possessed abundant natural talent which he devoted to the representation of human likeness and character, bringing his witty and irascible manner to bear on each of his works, including his incisive portraits of George Washington. Stuart's legacy is defined by the seemingly contradictory aspects of his life. He was quite prolific, executing more than 1,100 portraits, despite bouts of depression that sent him to his bed for weeks at a time. Like other artists of his caliber, he is remembered for his masterpieces, despite a pattern of failing to finish or summarily finishing works that bored him. He commanded high prices, but constantly teetered on the verge of bankruptcy. More than a few of the sitters who enjoyed his company and anticipated the skillful portrait that would result were disappointed that the painter's slow, dilatory work habits. Said John Adams, who sat for the artist several times, "Mr. Stuart thinks it the prerogative of genius to disdain the performance of his engagements."

Stuart usually follows [Benjamin West](#) and [John Singleton Copley](#) in the canonical story of American art and, as a student of the former and admirer of the latter, his attachments to these elder painters are undeniable. His career nearly parallels that of his almost exact contemporary John Trumbull ([06.1346.2](#)), whose equally complex and testy personality matched Stuart's erratic disposition. The principle difference between the two is that, while Trumbull alternated between anger at his patrons and guilt for not having pleased them, Stuart remained unfailingly sanctimonious. He knew well the conventions of portraiture, easily rendered the attributes of gentility and affluence, and succeeded time and again in executing portraits that fulfilled in pictorial terms the wishes and desires of his sitters. That said, he maintained that his success had little to do with a sitter's character or accomplishments, but rather more with his own artistic abilities. More than once, Stuart escorted to his studio door sitters who thought otherwise.

Stuart first proved his talent in Newport, Rhode Island, near his hometown of Kingston. In portraits executed there, Stuart revealed not merely precocious talent but adept technique controlled by his rather quirky and appealing take on contemporary British portraiture. He mastered the techniques of the English grand manner during his years in London (1777-87) and Dublin (1787-93). For an American painter, [study in England](#) was a prerequisite for attaining greatness, but Stuart traveled there more due to haphazard circumstances than deliberate action, a pattern that would be repeated again and again. It took him five years to achieve acclaim for his work in London, but after the exhibition of masterful full-length portraits like [Captain John Gell \(2000.450\)](#), he joined the

More Information

- Explore & Learn: [John Singleton Copley](#)
- [Celebrating the American Wing: American Portraits](#)
- Special Exhibition: [Celebrating The American Wing: Notable Acquisitions 1990-1999](#)
- [American Drawings and Watercolors in The Metropolitan Museum of Art: Highlights from the Collection, 1710-1990](#)
- [Gilbert Stuart](#)

Gilbert Stuart page in the Timeline of Art History

Finding our way through the Timeline, we are connected not only to the information on this website, but also to the exhibitions and educational materials. But from the exhibition site or the view of Stuart's painting in the Collections, we remain unaware of the information elsewhere in the Enterprise Web Space.

IV. THE SEARCH THAT FINDS THINGS EVERYWHERE

Finding and following links is only part of the solution in any large web space. A second critical issue is the information architecture of the search process, which includes how search results are organized and presented. The information architecture is not limited by advancements of search technology. Full-text search has become the "natural" way to find things on large websites. Most Web users are not computer scientists, and to them how or why a search produces results is not an interesting question. An Enterprise Web Space often has many different search indexes, for good reasons. The unstructured content of web pages is quite different from a museum's collection database, and the content of a digital image collection is quite different from the content of a gift shop. Requiring a different search for each kind of collection is a poor solution. First, it assumes that the user understands that he has not found something because he asked the right question in the wrong place. Second, it assumes that the user will know where to find the right place. Simply throwing all the results into a single list is also a poor solution. There is a difference between books for sale, paintings on display, and teaching materials, so why discard the context?

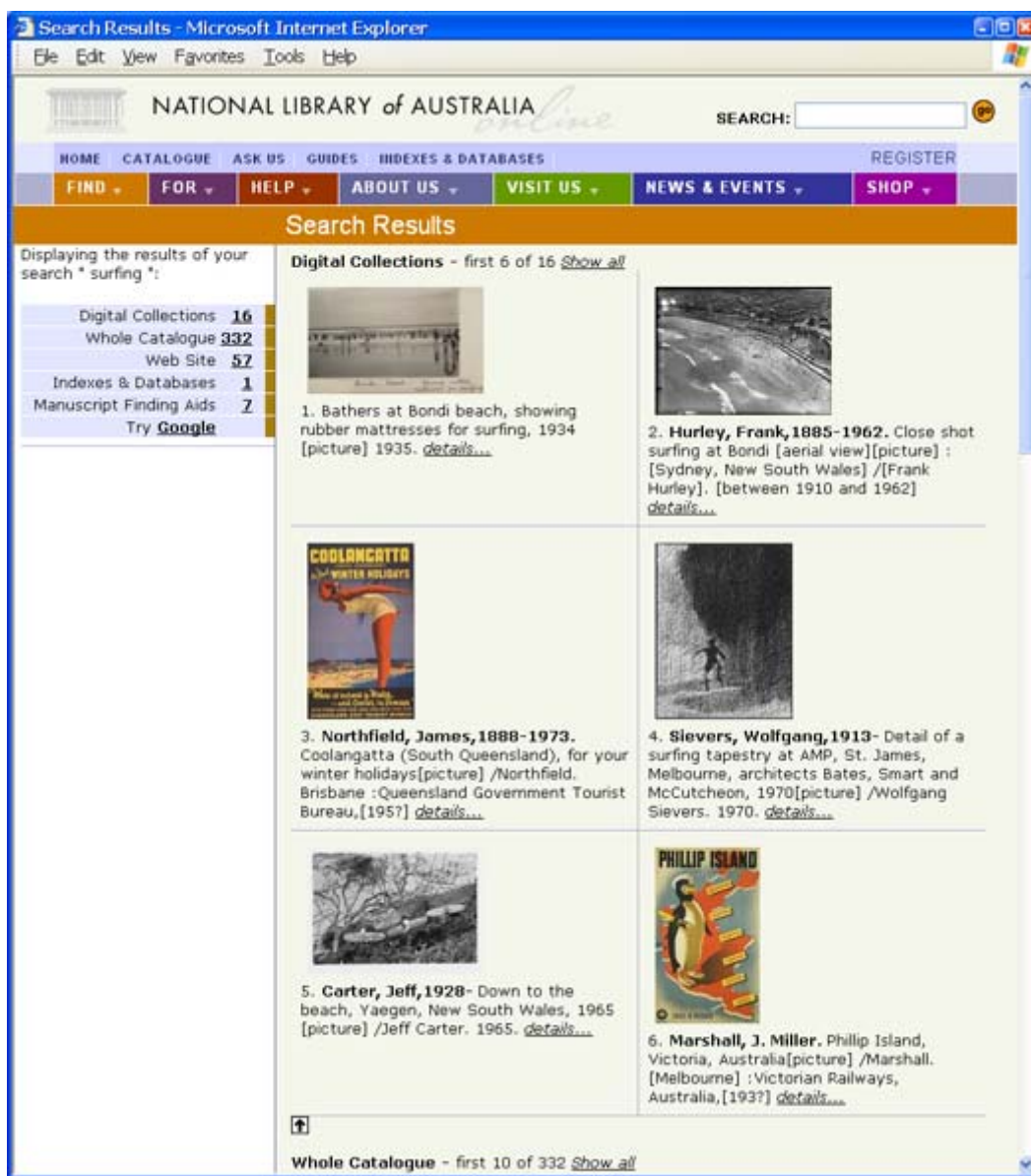
The Met site provides a good solution. The search for "Gilbert Stuart" presents a page that asks the user where he would like to find the answer: in the Collections, the Explore & Learn section, the Timeline, the Met Store, or the Calendar? Each choice presents a useful set of answers, taking advantage of the structure of these separate websites and databases. We are not surprised to find a page in the middle of a lesson if we choose Explore & Learn. We expect to find something we can purchase in the Met Store. The search of Calendar presents a complete list of events, with useful category labels so we can distinguish between a lecture, a teacher program, and a gallery talk.

We can turn to the National Gallery website for a counter example. If we want to find Gilbert Stuart, we are forced to choose between Search the Collection or Search the Site, each with its own place to type. To see if what we are

looking for exists in both, we have to do the search twice, with completely dissimilar user interface. Neither of these searches finds anything in the National Gallery of Art Library database, which must be discovered in the Resources section of the website. This part of the web space requires separate searches for items classified as books, auction, slides, and photos. Granted, the content of the library catalog is not the same kind of information as the pages of the website, but all are part of the National Gallery web space, so why hide parts of it from the average user?

An inspiring example of how a well-architected search can provide is found at the **National Library of Australia** (NLA) website. Like many major libraries, the NLA has more than one online catalog. Separate databases contain information on collections of manuscripts, photographs, sound recordings, and paintings, as well as books. Until recently, a user had to search each of these catalogs individually to determine what the library held on a specific subject. The NLA web space also contains many digital collections ranging from 18th century manuscripts and ship logs to photographs of contemporary dance performances. These are found on separate websites, each with their own search.

Today, a single search of the NLA website finds everything. A search for “surfing” presents a page that summarizes how many items are found in Digital Collections, Whole Catalogue, Web Sites, Indexes & Databases, and Manuscript Finding Aids. The user is presented with the first results in each category including small images from the Digital Collections, and a one-click path to these top items or the complete results in each category. We are quickly shown the scope of information we can find, and reminded of the variety of information sources at our disposal.



NLA Search result page for "surfing"

This is not so much a leap in technology as a leap in imagination coupled with good user interface design. The value of connection has won over the value of separation, without diluting the value of separate types of collections. It is this direction that will bring tremendous value to the users of the Web, and to the institutions and enterprises who use the Web as a new communications channel.

Resources

- Vannevar Bush
“As We May Think,” Vannevar Bush, *Atlantic Monthly*, July, 1945
<http://www.press.umich.edu/jep/works/vbush/vbush-all.html>
Memex animation (for Mac or Windows) on the Kahn+Associates web site
www.kahnplus.com/publication/en/online.htm

- AGRAM Architecture Information
www.bk.tudelft.nl/agram

- The Digital Object Identifier System
www.doi.org

- Metropolitan Museum of Art, New York
www.metmuseum.org

- National Gallery of Art, Washington DC
www.nga.gov

- National Library of Australia
www.nla.gov.au