Information Arts

Information arts are the thoughtful arrangement of data. A chapter title in a book, for instance, is a composition of word data. Information arts have many functions, but the function most relevant in the context of the computing medium is supplying navigation mechanisms. The print medium has pagination, divider pages, display heads, pull quotes, and captions — all are conventions that help the reader navigate through a book or magazine’s content, and each is a highly evolved information art form. Our familiarity with the book form makes the comprehension of its information arts, and their use as navigational mechanisms, second nature; anyone who picks up a book knows where to find the bibliography, the index, and the table of contents.

The digital equivalent of such a vital art form does not exist. Because digital media have no tactile depth, we have a limited understanding of the size of a body of work or the amount of information on a CD-ROM or behind a screen — whereas in the print medium, we just have to leaf through a book or magazine to get that information. In this early stage in the development of information arts for the screen, we still lack a comprehensive vocabulary for expressing concepts, such as sequences. Some conventions — icons, directional arrows, and main menus — have already become established in the digital lexicon, but others — morphing navigation bars and virtual 3-D spaces — are too new to make the list.

One reason our digital wayfinding vocabulary is scant is that the so-called screen real estate available for displaying information and navigational cues is limited. In print, organization of and navigation through content are intrinsic to form and function. No one wonders whether the numerical data on a printed page are prices or page numbers; the data’s location and context determine meaning. Digital media are some distance from attaining the clarity of the print medium, but one way to work toward resolving navigational problems and accommodating content in digital formats is to understand how information is organized.

Organization Models
Although named differently in linguistics, music, and the visual arts, the seven universal data organization models — linear, hierarchical, web, parallel, matrix, overlay, and spatial zoom — underlie the structure and presentation of ideas. They support five data types: text, audio, music, pictures, and moving pictures. These models can be used as diagnostic tools
for examining the behavior of data types in the computing medium; they help decipher the function and form of data, determine whether structural models are transformable and transferable to other media, and indicate the context for the information after it is translated into a new data type. Rarely are the seven principles applied singly to any structure; integrated systems in both the physical and digital worlds generally are based on a combination of several models.

It is the purpose of any project that determines which information arts will be applied (in the form of data types or organization models). The specific purpose of a dictionary, for instance, determines its function and organization model; the linear model would be the wrong one to use to format a dictionary, but it would be the right one for a novel. For every purpose, there is an organization model that will facilitate its function.

A dictionary has a rule-based design system, which means that the parameters for arranging the data are fixed — altering the organization model results in a dysfunctional dictionary. Introducing a dictionary format into the computer medium requires that a bridge (in the form of computer code) be built between the engineer and the user. The software engineer creates the code for the dictionary application using database structures such as inverted indices, hash tables, and hardware access metrics; these structures have little relevance to the potential dictionary user — who only wants to look up a word — but are essential for the dictionary to function properly.

The computer code, which optimizes the performance of a system and the use and display of content, can’t be seen by the user, but its effects are perceptible. An information designer bridges the gap between a user’s cognitive model and an engineer’s database structures by creating an interface that deploys familiar organization models, corralling data into groupings and perceptible hierarchies.

The unlimited possibilities resulting from combining organization models change data relationships, especially when these models are transferred into digital form. A designer must define and quantify the potential functions of organization models — choosing one or another set of features for a product or service. Through compromise, information designers create balance among portions of data — making the decisions that transform the data residing in organization models into meaningful work.
This matrix shows how strong an influence each of the seven organization models has on the basic structure of familiar applications in different media. The larger the dot, the stronger the influence. The structures at the bottom are applications that the computing medium has made possible. The potential of all the new technologies those applications are based on has not yet been realized; although that makes it impossible to determine definitively how the organization models might influence those applications, it is likely that the influence of all the models on all such applications will be great.
Navigating Through Information
People, time, and space — how do they all come together? Information designers need to know how people move through spaces and what they do in those particular spaces. One of the most important issues in information design is determining how to navigate through a designed space. When information designers identify the particulars of time, space, and place, they can create familiar structures and syntax that help define the paths which people, or — in the case of computing — information will move along to get from point A to point B. Navigation is a system in itself, and there are many ways to design navigation in cyberspace so that people can visit places, buy things, or play or work with each other. If people are engaged in those activities in the computing medium, how does the information designer build an underlying navigation system? One way is to use the architectural model of signage.

A subway station is a good analogy for what users are trying to contend with in the computing world. Have a limited understanding of how large the system is, but signage cues tell them whether they can reach a destination by moving “up” (ahead) or “down” (back) or left or right. Signage systems incorporate a vocabulary that helps people go where they want to go. That doesn’t mean that designers should apply subway signage metaphors to everything they design for the computing medium — there are many other efficient navigation systems. Tables of contents and color coding are navigation systems we use all the time quite successfully. Subway signage is just an especially pertinent example of a navigation system with established conventions. The computing medium has few accepted conventions, so designers must practice information design as a way to begin building a core vocabulary for use in cyberspace.
Mapping is a set of conventions that explains geographical concepts and the idea of place; it is a visual construction with the capacity to embrace the complexity of language itself. The London Underground map embodies a visual language that we can apply to the understanding of the way digital systems operate. A map is quite visceral— if people don’t understand it, they get lost. The London Underground map is considered a diagram because it does not actualize the surrounding geography; however, it easily accommodates the diversity and complexity of the railway system. A look at the evolution of the London Underground diagram reveals many similarities to the evolution of the computing medium in terms of the creation and definition of language.

The London Transit Authority’s first maps showed the actual railway routes in and around London. These first maps appeared to make sense because of the contextual relationship between the railway system and the actual area it covers— it seemed that riders using this kind of map would know exactly where they were. People nevertheless got lost in the subway, and as the system grew, riders became more and more confused.

The diagram proposed in 1932 by Henry Beck, a 29-year-old engineering draftsman, contained only what was essential for riders to understand in order to get around inside the system. He abstracted routes and edited out what was not necessarily helpful to the riders’ perception of where they were in the system, emphasizing the Underground’s connections rather than its surrounding geography. In the end, the only contextual element Beck used was the River Thames. The rest of his diagram, made up of a network of vertical, horizontal, and diagonal lines, was purely functional: he compressed the outlying portions of the routes, which made room for the enlargement of the central district, with its complexity of interchanges and stations. To abstract the map into a diagram, Beck himself had to have a very good working knowledge of the railway system and its environs. Underground riders quickly adapted to the diagram.

People get lost in cyberspace too, and just as the art of mapping helps railway riders find their way, so too can it illustrate links within structures and crossovers between media and data types. Mapping is a prerequisite for smooth navigation through cyberspace. Once someone on a project team gets
all the thoughts and ideas about the project down on paper, the designer can use that material to map out the project's requirements. Once those requirements are mapped out the team can begin the scripting, programming, and graphic design. It may help an information designer mapping out a project to imagine designing Grand Central Station: where should the portals be? the different gates? where should they lead? In other words, how accessible should the elements of a project be? Mapping is the process of creating a framework, just as diagramming a sentence helps define the nature and scope of language. In the context of business initiatives, mapping is a terrific exercise for understanding the exact nature of a problem. Mapping can clarify many problems that seem nebulous at first glance.
If Mr. Beck Had a Computer

What Mr. Beck did was visualize the kind of information riders needed to get from Victoria Station to Regent Park. His diagram for the Underground was the solution to a problem; it was also the end product of his work. In the computing medium, a solution is generally not something as absolute as a hand-held diagram; instead, it's a process. Mr. Beck was working with physical realities the computing medium doesn't offer. Designers used to design nouns; now they design verbs.

How can an information designer go about mapping complex systems and concepts to create a usable system? One way to determine the design parameters of complex information spaces and solve the design problems they present, is to understand what a user, viewer, or customer needs or wants to accomplish. The structures that underlie language are excellent diagnostic tools for those needs and wants. Language is a formal, universal framework that is common enough to encompass most structural problems, but most importantly, it is people-centric. Designers can use basic conversational language to build diagnostic tools, and language is an ideal structure for an information framework.

In one example, a design firm was asked to create an electronic reference resource library for a large medical institution. It took many months of research and development to examine all the aspects of the content and determine the system's optimum functionality. At this juncture, the challenge was to determine what kind of disciplines would be required to take the project forward. Is it the software engineering or the various medical specialties. Who should be doing what?

The designers used sentence diagramming to solve the problem. The simple sentence "Show me what I need to know about the heart," represented all the functionality the system required. The designers dissected each word and its meaning in the sentence to uncover its alternate computer function. "Show," for instance, meant present and display. "What I need to know" translated as information the computer had to identify and match. Once the project's basic functions were understood, the sentence diagram model was translated into the computer model, matching functions, knowledge levels, age, learning levels, etc.
Learning levels, etc. Language helps diagnose and identify the nature of a problem, and match needs with appropriate solutions.

Bubble diagrams are another way for designers to create frameworks for efficient processes. Architects use bubble diagrams to organize people's movements through particular spaces in a specified order; as in determining how to accommodate the activities of people in a cafe and a bookstore, for instance. Designers need such visualization techniques to define navigation and interactivity.
Information Architecture

The architectural model is apropos to the computing medium because architecture is concerned with the relationships among people, time, and space — architects design and create systems to move people in time and space. The kinds of materials architects use to define space are cinder blocks, wooden beams, and copper pipes. In the computing medium, designers create systems by plotting structural and data type information as x and y axes; when different media are factored in, the z axis is introduced; and so is the equivalent of three dimensionality in cyberspace — complexity.

Consequently, spatial models are important to designers building models that represent relationships in the digital environment. Working with spatial models may be a stretch for many designers, since in general, designers have limited experience working with the spatial dimension.

The architecture of an operating system is the organization of data instructions and computer code that indicate the way information should be passed along. Few designers have taken information structures to the level of spatial depth (see page 115). Most information in cyberspace is still two-dimensional; depth of information in cyberspace is detailed information.

Designers have much to learn from architects. Just as an architect wouldn’t go forward with a blueprint for a convention multiplex if the proposed site were on swampland, a designer shouldn’t begin planning huge information systems before understanding the system’s technological underpinnings. This doesn’t mean that designers have to be computer engineers any more than architects have to be geologists, but they do need to know what the relevant technology does and who will be using it. A current, renowned example of construction on digital swampland is the Orlando project, which was supposed to bring interactive TV to homes — the alliance partners for this venture went ahead with the technology without reconciling the social wants and needs. Projects that are well designed only look simple because designers and others have spent countless hours making them look that way.

Architectural order is created when the organization of parts makes visible their relationships to each other and the structure as a whole. When these relationships are perceived as mutually reinforcing and contributing to the singular nature of the whole, then a conceptual order exists — an order that may well be more enduring than transient perceptual visions.

Francis Ching, Architecture: Form, Space and Order
Creating the database and operating system architecture for a multifunctional corporate Web site, for example, require that everything seen and used in the computing environment relate to the systems within. The diagram is not just information architecture, but an integrated view of the elements required to create that architecture. The gold represents right-brain professions and the blue, left-brain, that is, artistic and scientific. The lower levels of the diagram require the skills of scientists and computer programmers, while the top layers demand serious academic design talent; right now, the most sought-after professionals are those who have the ability to mediate between the two worlds. View the CD-ROM.

These configurations (see communication layer, left) represent the way information is passed along through networks. See William Mitchell and Malcolm McCulloughs in-depth study in Digital Design Media.