6.1 Case study: the desktop and the map

Objective

This case study shows how different types of interfaces split information. While splitting generally requires allocating information across different hierarchical levels, such allocation can be done in two opposite ways: through a top-down, unambiguously defined hierarchy or via the discovery of an emergent hierarchy from the bottom-up. Through the examples of popular interfaces, the desktop metaphor and the search engine interface, the case study will show how splitting works in either case and that the choice of a bottom-up vs top-down approach has to be based on the nature of the task and the knowledge that the users possess.

Background

Top-down splitting: the desktop interface

Most computer users today interact with their machines through a desktop interface. A desktop interface organizes digital information just as documents are organized in a physical office. The virtual environment recreates an action space whose elements map over the real-world counterparts through the combination of visual icons depicting the objects and a "point & shoot" system based on a mouse through which we can move objects around. This interface is extremely popular, and for a reason. It beautifully renders in the digital world our mental model of what an office is and how we manage information in that environment, so much so that we can use the same terminology to refer to both physical objects and their counterpart.

Our computer desktop has a space that looks like the surface of our real desktop. Information is contained in files that can be organized in folders. The files that we do not need can be dumped in a trash can. The digital environment offers tools to manipulate and organize information such as the Drag & Drop or Cut, Copy & Paste functions. Some of the programs' icons are also visualized as their real-world counterpart such as the notepad or the calculator.

The first commercial implementation of the desktop environment was developed by Xerox in 1978, following the insights contained in Douglas Engelbart's work on human/machine interaction (Engelbart, 1968). In 1983, Commodore proposed Magicdesk, a graphic user interface in which the mapping between real office concepts and tools and their virtual images is as literal as possible (see this link for a visual of the Magic Desk Interface http://toastytech.com/guis/magdesk.html). For instance, to access the word processor, users had to click on the icon of a typewriter (clicking was done through a joystick, not a mouse). Interestingly, today that icon would not probably be appropriate since younger computer users likely have never seen a real typewriter in their life.

Xerox's and Commodore's attempts to develop a desktop interface had limited market success, but the idea became mainstream soon after with the Apple Macintosh released in 1984 and even more so with Microsoft Windows 3.0 (ironically dubbed by someone as 'the first Windows edition that really did not work well' alluding to the fact that the previous

Windows version just did not work at all). Steve Jobs was furious when Microsoft brought Windows to the market and accused Gates of stealing the idea from Apple. Bill Gates rebutted the accusation by saying that, if he had stolen the idea (which he never claimed he did), he stole it from Xerox, very much as Apple did. As reported in Walter Isaacson's biography of Steve jobs (2011), Gates told Jobs in a meeting: 'Well, Steve, I think there's more than one way of looking at it. I think it's more like we both had this rich neighbour named Xerox and I broke into his house to steal the TV set and found out that you had already stolen it.'

Bottom-up splitting: the map interface

If you are old enough, you may remember the frustration of using the first internet search engines such as Ask Jeeves, AltaVista, and everything else available in the pre-Google age (to have a visual of the AltaVista home page, you can visit the Wikipedia page https://en.wikipedia.org/wiki/AltaVista). The limited performance of the early search engines was not so much due to limited hardware capabilities and lack of sophisticated algorithms, but in a design conceptual bug deriving from the application of the wrong design metaphor. The old search engines were inspired by the desktop metaphor, not only in terms of graphic layout but also, more importantly, regarding the search algorithms they employed. The early algorithms were mostly based on content match based on keywords and dictionary taxonomies. The basic idea was that knowledge could be organized into a structured hierarchy, called a taxonomy, in which concepts can be orderly classified in higher level categories. A taxonomy based on a dictionary looks like a tree, with the higher-level nodes corresponding to more general concepts and the lower levels to more specific ones. In a taxonomy, two concepts are close when there is little sematic distance between them, as measured by the number of steps it takes to go from one concept to the other following the connections available in tree. So, 'mum' and 'dad' are very close concepts because they are under a same category ('parent', which also happens to be their parent node – pun intended), whereas 'pig' and 'lipstick' are quite unrelated because they are far apart in the tree.

Taxonomies are a great way of organizing knowledge. However, they work only when information can be organized using hierarchical, well-established, and agreed-upon criteria whose meaning does not depend on the context. This is the case, for instance, of the biological classification of living beings into classes, orders, family, genus, and species. Taxonomies are of limited use when you surf the internet (another metaphor to suggest you have to navigate in an ocean of unknown and unchartered information), considering the ambiguity of natural language and the wide variety of reasons that can motivate an internet search. Consider the many meanings of the word family and their relevance to different users who are searching for a) a specific family (e.g. the Windsors); b) a biological family (canids); c) family-friendly vacation (family as a marketing segment with specific market needs), etc. Or consider an expression such as 'Put lipstick on a pig', which in the proper context most Americans[1], and possibly most English speakers, would understand but which is formed by two words that in a dictionary taxonomy would be quite far apart.

[1] https://slate.com/news-and-politics/2008/09/where-does-the-expression-lipstick-on-a-pig-come-from.html

What gave Google an edge was the understanding (and its translation into a complicated and ever-evolving algorithm) that we need to rely on other people's recommendations when we have to navigate information we do not know. And not any people, but supposedly competent sources. The basic idea behind Google's algorithm PageRank is that a site's relevance depends on how many relevant sites point to it. The definition (and the algorithm) is recursive and is cause of some headache, but it translates into code through which a machine can quantify a very basic social concept: reputation. It was maybe for this reason that Google stripped everything from the design of the interface of its home page. A design choice in stark contrast with what the home page of competitor websites looked like: a naked space with a search bar symbolizing that Google does not presume to know what you are looking for.

In terms of mental models for information organization, PageRank relies on an underlying network of nodes and links in which the importance of a node grows with the number of links and the importance of the other modes pointing to it. We call this interface model the map. A map works in the opposite way of a desktop metaphor. The desktop metaphor is based on top-down hierarchy (taxonomy) the user must be familiar with. The critical tasks it supports are organizing and locating information in a known framework. A map interface is based on bottom-up hierarchy created by mutual references provided through links and reputation. Users can make sense of this emergent hierarchy by building a mental map of an information landscape they are not familiar with. The critical tasks are 'find' and 'discover'.

The analogy with an actual map can help to explain this concept. If you visit a new city for the first time, you will probably rely on a tourist map and advice from knowledgeable others. The tourist map is the conceptual equivalent to the results of a Google search because the map will give disproportionate importance to elements of interest for tourists such as sightseeing sites, shopping venues, hospitality and information services. The map has been crafted by someone based on the interest of other tourists that visited before you and their collective knowledge. Finally, you can use the maps without having a mental model of the city structure, layout, and prominent features. On the other hand, if you live in that city and know the place well, you won't find the map useful most of the time. Your mental model of the city is quite well developed, the map is interiorized, you know how to go from A to B and where to look for most of the things you need. If anything, this mental model is a personal taxonomy in which you have classified places to go and things to do.

Splitting in a map works more towards supporting users to move from the big picture (the city) to the details (a specific site) than helping them to catalogue and manipulate information. Bottom-up splitting helps users discover content and functions, navigate abundant information, and identify personalized ways of navigating this information.

Instructions

By comparing the desktop and the map, it should be clear why sometimes we cannot find information on our computers. Or why, when we have to search for the personnel directory in the university web site, it is quicker to ask Google than navigating the structure of the specific web site in search of the appropriate section. Vice versa, the effectiveness of the

tools offered by search engines to organize information in the desktop way, such as favorite web sites or tagging, can also feel limited.

In the following table we summarize and compare the characteristics of the two splitting metaphors.

	Desktop	Map
Foundational metaphor	Building (architecture)	Network (nodes, hubs, sub-networks)
Information organization approach	Top-down	Bottom-up
Information model	Taxonomy based on established, acontextual, and agreed upon knowledge	Networks of nodes of various importance based on references and reputation
Information navigation	Driven by a priori knowledge	By trial and error
Information visualization	Visual metaphors (e.g. Icons)	Ranked Lists
Information processing	Manipulation (move, modify, etc.)	Assessment (reputation, relevance, people like you might also like …)
Tasks for which the splitting metaphor works better	Organize a limited amount of information Simulate a known environment Manipulate information Classify knowledge for later retrieval and reuse	Navigate abundant and unknown information Move quickly and easily between the details and the "big picture" Learn/discover Identify personalized routines or shortcuts to navigate the information space and execute specific tasks

Table 6.1a. - Desktop versus map splitting metaphor

Your turn now. Use the examples and the table above to answer the following questions:

1. List a couple of interfaces you are familiar with or that you encounter frequently. Do not limit yourself only to digital interfaces.
2. Observe which one use the desktop metaphor and which ones use the map metaphor or whether the interface support some type of hybridization between the two. A quick test could be to ask yourself the main tasks the interface supports? Organize & Locate or Discover & Find?
3. Comment on whether the use of the metaphor is appropriate for the tasks the interface is supposed to support, and which are the pros and the cons (hint: a key metric to assess if information is split in the right way is to measure how easy and fast is for a user to locate the information she is looking for).

4. Summarize your findings in the following table (analyze at least 2 interface or as many as requested by your instructor).

Interface	Dominant metaphor (e.g. desktop, store shelf, map, etc.)	Describe whether the metaphor works well in terms of splitting information across different layers (provide a couple of examples)

References

Engelbart, D. (1968), The mother of all demos, https://www.youtube.com/watch?v=yJDv-zdhzMY

Isaacson, W. (2011), Steve Jobs; a Biography. New York (NY): Simon & Schuster.