

Impetus Paper

The main source of motivation for my thesis development is based on a solid cooperation between Information Architecture, Data Visualization, and the Science of Complex Networks.

My curiosity in Information Architecture was initially fostered in Christopher Kirwan's MFADT class in the Spring of 2004, and since then, it became a major subject of interest and awareness. I remember observing for the first time a diagram with four interconnected circles representing the continuous **Understanding Spectrum**. Data originates information, which leads to knowledge and ultimately to wisdom. This concept influenced my view and made me reflect on the responsibility I had, as a designer, to contribute to this spectrum.

We may have access to an abundance of information but I strongly believe we lack the ability to process it effectively. In face of contemporary technological accomplishments, our ability to generate and acquire data has by far outpaced our ability to make sense of it. Neither raw data nor scattered information offers any level of meaningful understanding. This is where Information Architecture and Data Visualization undertake an important mission. If we are truly entering a fourth phase in human-kind, a theory defended by a large number of anthropologists and sociologists, then Information Architecture is going to be a golden key in the process. In a world increasingly driven by information, it rapidly assumes the form of power, and typifies society in terms of those who own it and those who don't. Meaningful information is not a given fact, and particularly now, when our cultural artifacts are being measured in terms of gigabytes and terabytes, organizing, sorting and displaying information, in an efficient way, is a crucial measure for knowledge and wisdom.

In the Spring 2004 semester I was involved in two projects that were decisive in the delineation of my thesis domain of interest and my increased alertness towards Information Architecture and Data Visualization. One was a group project developed at the Information Architecture class, taught by Christopher Kirwan. **Self-Replicating Cloners** was a project aimed at producing visualizations of Virus, their progression through time and world scale dissemination. Two viruses were analyzed by comparison,

SARS and MyDoom, each one representing its underlying field, human biology and computer technology. The second motivation was a group project was developed in a collaboration studio with **Siemens Corporate Research Center**. Aimed at Siemens Medical, **DSS – Disease Surveillance System** was a visualization and communication tool that shared symptomatology data between hospitals and health care professionals for detecting possible disease outbreaks and recognizing development patterns nation wide.

After these two particular experiences, I started my summer research with some clear interests in mind, but still scattered through distinct areas such as artificial life, virology, cognitive science, genetics, cyber biology, epidemiology, and pattern recognition. *Emergence*, by Steven Johnson, was the first book I read in my research and it was a surprising start. The paradigm of Emergence, which can be described as a “higher-level pattern arising out of parallel complex interactions between local agents”, was slowly overflowing my mind with bright new discoveries. And with an augmented motivation, I started gradually abandoning some initial ideas and, in other cases, finding common links between them, under the sciences of complexity and self-organization. The search for answers on how order can emerge from disorder, and organization emerge from chaos, guide me to initiate a study on the individual parameters of emergent systems, such as collective/macro behavior, self-organizing communities and bottom-up hierarchy.

This research led me inevitably to complex systems. Delving into this new area was even more thrilling. Finding each day, a common structure in apparent distinct fields, or similarities between natural systems and human designs, was beyond doubt overwhelming. From that point on, I became extremely fascinated with the omnipresent web of signals and interactions, nodes and links that shape modern complex networks from social networks, to corporations, cities, living organisms and the Internet.

Complexity is a challenge by itself. Complex Networks are everywhere. It is a structural and organizational principle that reaches almost every field we can think of, from genes to power systems, from food webs to market shares. Paraphrasing Albert Barabasi, one of the leading researchers in this area, “the mystery of life begins with the intricate web of interactions, integrating the millions of molecules within each organism”. Humans, since their birth, experience the effect of networks every day, from large complex systems like

transportation routes and communication networks, to less conscious interactions, common in social networks. A Scale-Free network, the most common topology in either natural or human systems, is curiously enough, a very recent breakthrough. Since its discovery, 6 years ago, dozens of researchers worldwide have been disentangling the networks around us at an amazing rate. This awareness is helping us understand not only the world around us but also the most intricate web of interactions that shape the human body. The global effort of constructing a general theory of complexity is tremendous and may lead us, not only to a structural understanding of networks, but to major improvements in stability, robustness and security of most complex systems that shape the globe. Like Barabasi refers in *Linked*, “Once we stumble across the right vision of complexity, it will take little to bring it to fruition. When that will happen is one of the mysteries that keeps many of us going”.

For my thesis I’m not hoping to reveal the hidden theory of complexity but I’m hoping to produce an important footprint in this scientific journey. I’m eager to bring my expertise in interface design and my great interest in Information Architecture and Data Visualization, to facilitate the understanding of a specific network. The feature that fascinates me the most in complex network dynamics is **Dissemination Patterns**. The visualization of a path, and inherent duration, of a certain fad, idea, or virus, in a social/biological or computer network has been, since the beginning, a critical point of awareness. How does a particular contagion travel from point A to B, which nodes it affects in its course, and how fast it contaminates a large cluster or the entire network.

One thing I discovered on my summer research is that ideas, fads, trends and innovations show similar dissemination patterns as virus in social networks. The concept of **word-of-mouth** is a fascinating diffusion behavior that has always intrigued psychologists, sociologists, anthropologists, and lately marketers. To be able to map a word-of-mouth epidemic in a specific social network is a blue-sky scenario. And that might be true, in relation to physical interactions in a physical world between physical individuals. However, a trend on the Internet presents an interesting experimental laboratory to explore this behavior. **Blogs** embody an incredible case of word-of-mouth, where news, ideas and fads travel through community clusters with high infection rates. Because of their inherent nature *blogs* have become my ultimate fixation and the main frameset for my Thesis. Their high interconnectivity and shared flow of information represent not only an obvious case study of a word-of-mouth epidemic, but an

outstanding example of a dissemination pattern in a increasingly high complex network, estimated to be around 4 million nodes.

As an example, I'll mention a topic that emerged from the *blog* community in the beginning of October, 2004. On the first presidential debate, on September 30, 2004, between President George W. Bush and Senator John Kerry, there was an episode that got the attention of a particular viewer. "You forgot Poland" was the abrupt statement made by George W. Bush while John Kerry was enumerating the allied forces present at the Iraq War. The presidential debate occurred on a Friday evening, September 30, and on the following Monday night, there was a topic sharing 12 links among *bloggers*. This topic pointed to a specific URL – <http://www.youforgotpoland.com>. By that time, less than 72 hours after the debate, someone had already created a domain ([youforgotpoland.com](http://www.youforgotpoland.com)) and was selling online t-shirts and stickers with the same sentence.

This intriguing example reveals the accelerating rate of information flow among *bloggers* and how fast it spreads/contaminates online *blog* communities. Another issue of awareness, demonstrated by this example, is the possibility of tracking a possible outburst. Imagine this topic reaching the mainstream a week later, possibly a major newspaper or a particular TV show. How interesting would it be, to actually go back in time and discover where this outbreak first originated, the way it contaminated others and how fast it grew?

These last two queries have become a main source of motivation for the future development of my thesis. Quoting Duncan Watts, in regard to the mechanics of social networks: "To understand the pattern, we need to delve further into the rules by which individuals make decisions, and how, in the process, our apparently independent choices become inextricably bound together."