Ben Shneiderman

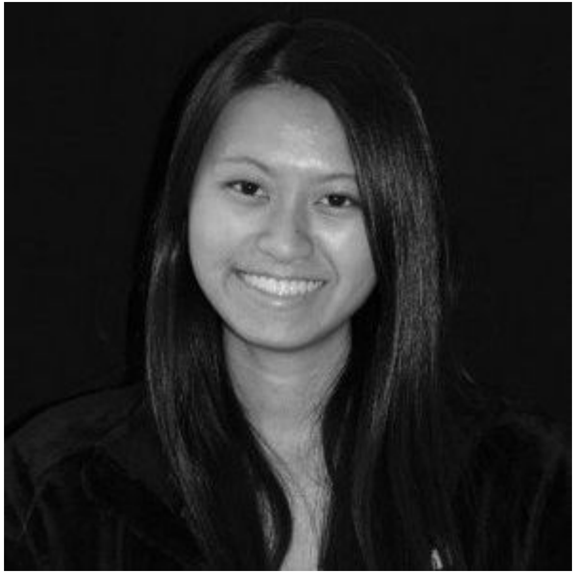
Presented by Dinah Coops, Bella Chiu, and Kyle Thomas

HCDE 501 - January 22, 2019

Ben Shneiderman at the TreeMap Art Project exhibit, 2013 https://treemapart.wordpress.com

Presenters

Dinah



Bella

Kyle

Career Trajectory

1963-2018
BS, MS & PHD
Teaching
Professor at
University of MD

1970-1973
Software Psychology
+
Nassi-Shneiderman Diagrams

1983
Hypertext Research and dev. of HyperTIES
+
Founding Director of HCI Lab
University of Maryland

1986
The Eight Golden Rules of Interface Design
+
Designing the User Interface

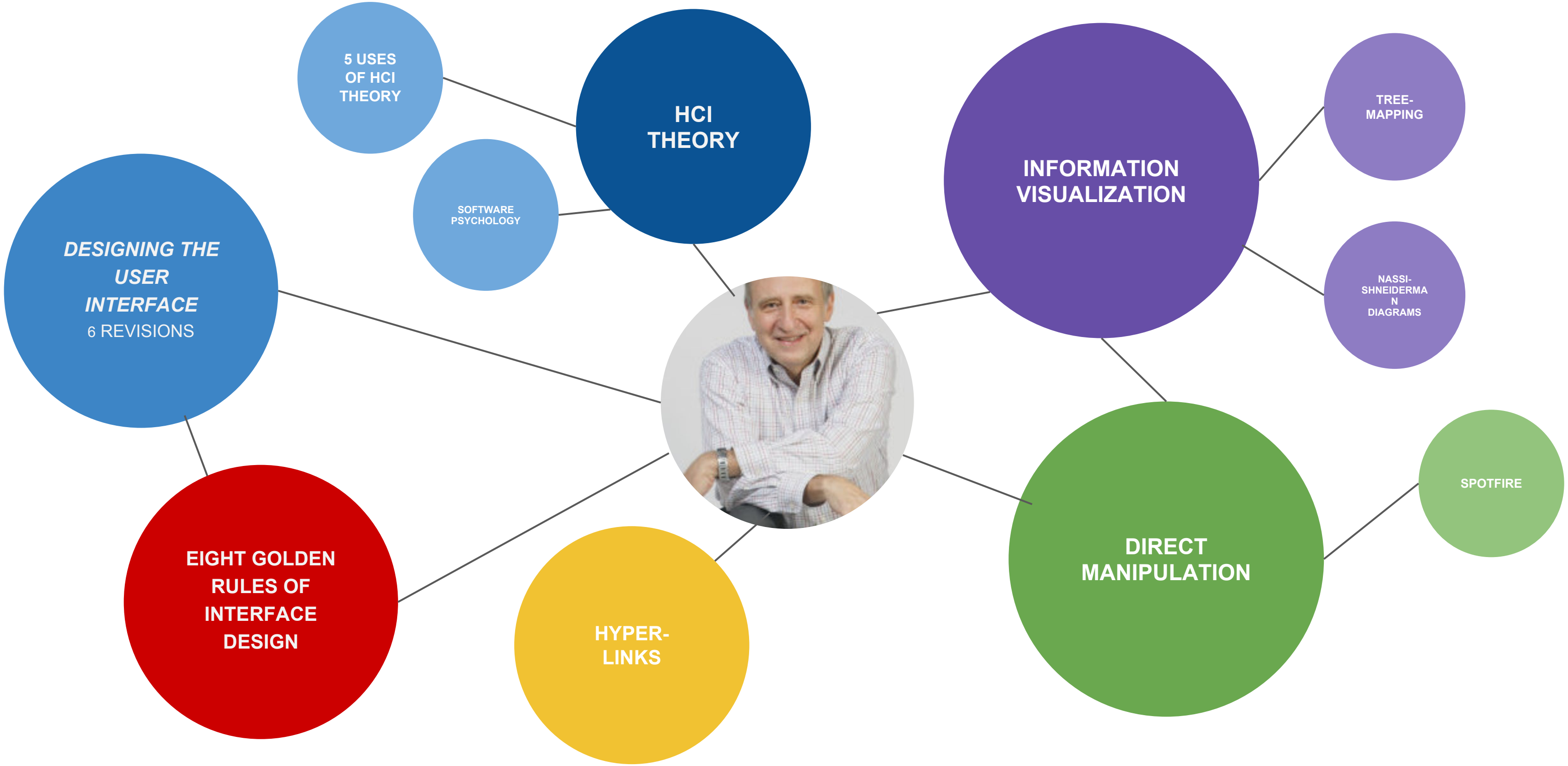
1997-1999
Direct Manipulation,
Spotfire
+
Reading in Information Visualization: Using Vision to think

2002-2003
Leonardo's Laptop
+
Craft of Information Visualizations
+
Treemaps

2010-2011
From Keyword Search to Exploration
+
Analyzing Social Media Networks with Node XL

2015-2018
Node XL
+
The New ABC's of Research
+
Rock the Research

Scope of Influence: Theory and Frameworks



Honorary degrees

1995
Honorary Doctorate
University of Guelph, Canada

2010
Honorary Doctorate
University of Castile-La Mancha, Spain

2015
Honorary Doctorate
Stony Brook University, United States

2017
Honorary Doctorate of Engineering
University of Melbourne, Australia

2018
Honorary Doctorate
Swansea University, Wales, UK

2002-2003
Honorary Doctorate
University of Pretoria, South Africa

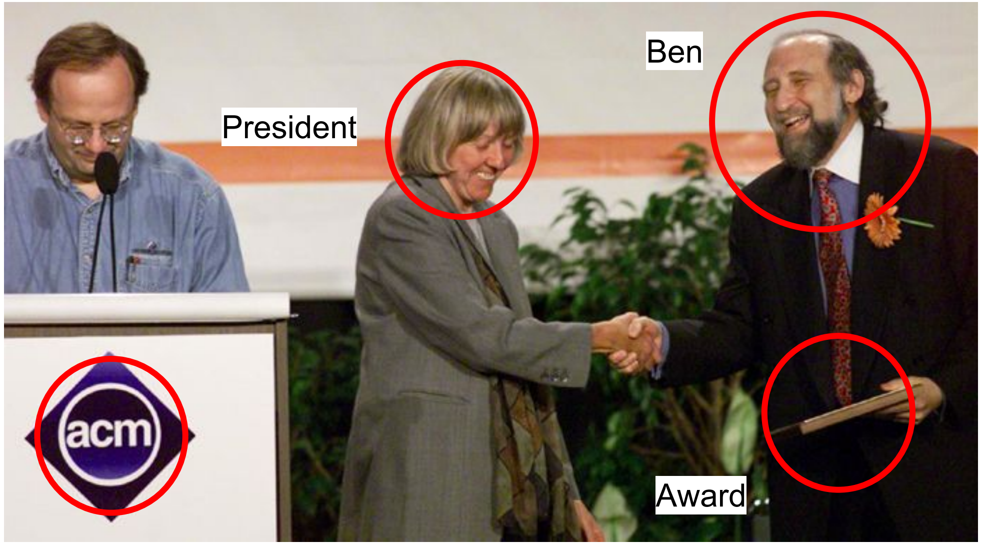
Achievements

2001 ACM SIGCHI Lifetime Achievement Award

ACM SIGCHI is the premier international society for professionals, academics and students who are interested in human-technology and human-computer interaction (HCI).

The CHI Lifetime Achievement Award is the most prestigious award SIGCHI gives.

Other recipients include Donald A. Norman, John M. Carroll and more.



ACM CHI Conference on Human Factors in Computing Systems in Seattle, WA, March 31 – April 5, 2001

Achievements

2001 ACM SIGCHI Lifetime Achievement Award

Tom Furness, Ben Shneiderman, Jenny Preece, and Andrew Sears

Ben Shneiderman receiving his SIGCHI Achievement Award and membership to the CHI Academy.

Achievements

2001 ACM SIGCHI Lifetime Achievement Award

> "
>
> *For over 25 years Ben Shneiderman has promoted human-computer interaction by writing, lecturing and researching about HCI. His landmark book, **Software Psychology**, made the world aware of the human aspects of computing while his internationally-acclaimed book, **Designing the User Interface: Strategies for Effective Human-Computer Interaction**, significantly shaped the HCI field for graduates, researchers, and practitioners all over the world. His widely-cited **1983 paper** described the nuances of **direct manipulation**. He soon applied these concepts to mouseable text links, called **embedded menus**, which are now commonly known as **hot links** on the World Wide Web. - SIGCHI*

Achievements

IEEE Visualization & Graphics Technical Community (VGTC)

2012 Visualization Career Award

IEEE is a global association of professionals working toward the development of technology-centered products and services

The IEEE Visualization Career Award is given every year to an individual to honor that person's lifetime contribution to visualization

Achievements

IEEE Visualization & Graphics Technical Community (VGTC)

2012 Visualization Career Award

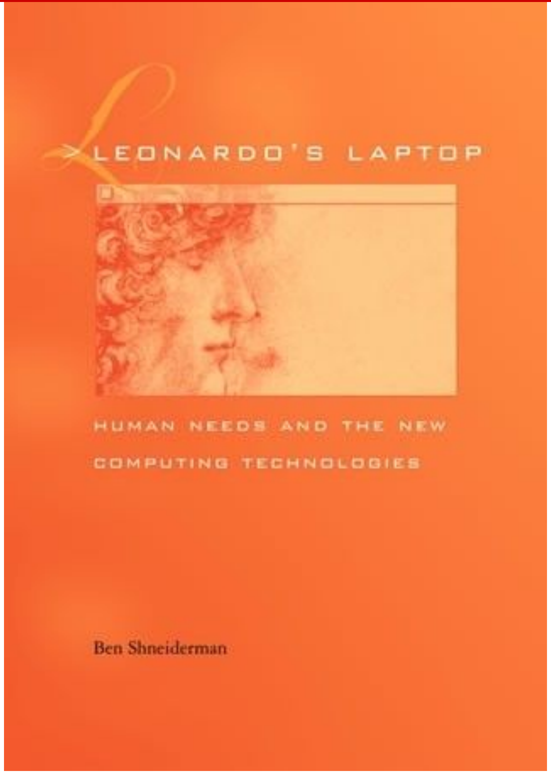
> “
>
> *Key innovations include the dynamic queries for **rapid visual exploration in multiple coordinated windows**, **treemaps** for space-filling visualization of hierarchies, **network analysis in NodeXL**, and **temporal event sequence exploration** for medical histories. - University of Maryland*

Achievements

2002 IEEE-USA Award for Distinguished Literary Contributions Furthering Public Understanding of the Profession.

The Leonardo’s Laptop raises computer users' expectations of what they should get from technology.

“The old computer is about what computers can do, The New Computing is about what people can do” - *Ben Shneiderman*



Achievements

IEEE Visualization & Graphics Technical Community (VGTC)

2012 Visualization Career Award

Shneiderman's video acceptance speech thanks his graduate students and Dr. Catherine Plaisant for their contributions over many years.

Overview of Important Publications

As of November 2018, Ben Shneiderman had articles in

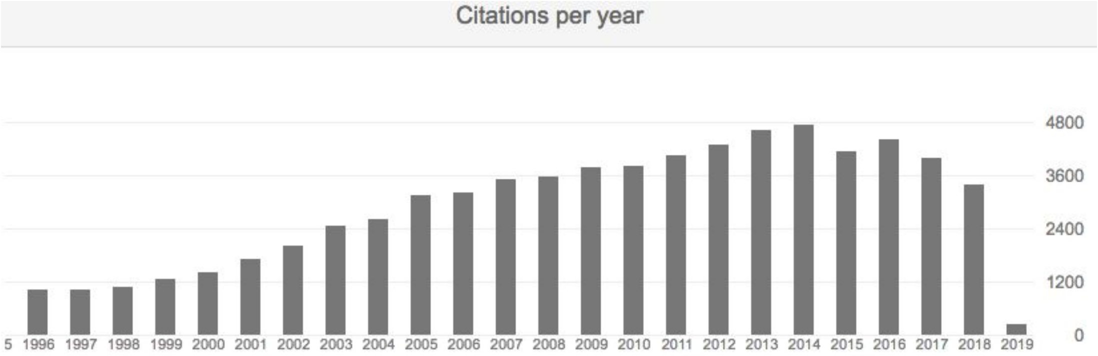
174 Refereed Journals

157 Refereed Conferences

92 Unrefereed Publications and

29 Chapters in Books

According to google scholar, he has been cited by in **79,135** citations.



Overview of Important Publications

Ben Shneiderman

Professor of Computer Science, University of Maryland
Verified email at cs.umd.edu - Homepage

human-computer interaction information visualization social media

FOLLOW

TITLE	CITED BY	YEAR
Designing the user interface: strategies for effective human-computer interaction B Shneiderman Pearson Education India	15913	2010
The eyes have it: A task by data type taxonomy for information visualizations B Shneiderman Visual Languages, 1996. Proceedings., IEEE Symposium on, 336-343	5236	1996
Direct manipulation: A step beyond programming languages B Shneiderman Computer, 57-69	2673	1983
Tree-maps: A space-filling approach to the visualization of hierarchical information structures B Johnson, B Shneiderman Visualization, 1991. Visualization'91, Proceedings., IEEE Conference on, 284-291	1894	1991
Tree visualization with tree-maps: 2-d space-filling approach B Shneiderman ACM Transactions on graphics (TOG) 11 (1), 92-99	1839	1992
Software psychology: Human factors in computer and information systems B Shneiderman Winthrop	1421	1980
Visual information seeking: Tight coupling of dynamic query filters with starfield displays C Ahlberg, B Shneiderman The Craft of Information Visualization, 7-13	1369	2003
Analyzing social media networks with NodeXL: Insights from a connected world	1152	2010

Overview of Important Publications

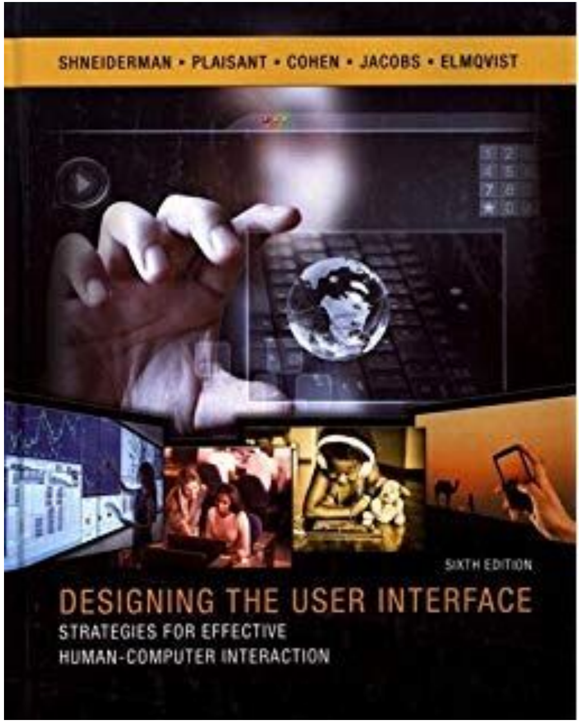
Designing the user interface: strategies for effective human-computer interaction

Cited by 15913, according to Google Scholar

Sixth editions as of 2016

It presents a broad survey of how to develop **high-quality user interfaces** for interactive systems.

Goals are to encourage greater attention to **usability issues** and to promote further scientific study of human-computer interaction, including the rapidly emerging topic of **social media participation.**

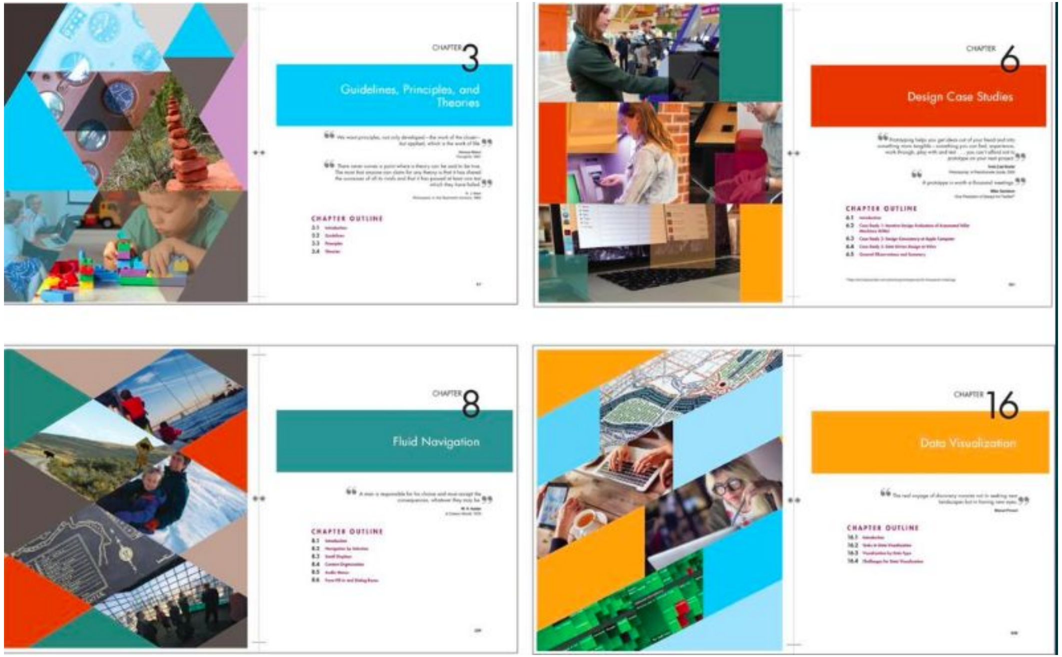


Overview of Important Publications

Designing the user interface: strategies for effective human-computer interaction

Topics include:

Gestures, pointing, voice, direct manipulation, menus, forms, commands, layout, color, sound, text, tables, graphics, instructions, messages, help, design, search, social media, visualization



Overview of Important Publications

The eyes have it: A task by data type taxonomy for information visualizations, 1996

Cited by 5236, according to google scholar

The paper offers a task by **data type taxonomy** with seven data types (one, two, three dimensional data, temporal and multi dimensional data, and tree and network data) and seven tasks (overview, zoom, filter, details-on-demand, relate, history, and extracts)

"overview first, zoom and filter, then details on demand"
- Ben Shneiderman

The Eyes Have It:
A Task by Data Type Taxonomy for Information Visualizations

Ben Shneiderman
Department of Computer Science,
Human-Computer Interaction Laboratory, and Institute for Systems Research
University of Maryland
College Park, Maryland 20742 USA
ben@cs.umd.edu

Abstract

A useful starting point for designing advanced graphical user interfaces is the Visual Information-Seeking Mantra: overview first, zoom and filter, then details on demand. But this is only a starting point in trying to understand the rich and varied set of information visualizations that have been proposed in recent years. This paper offers a task by data type taxonomy with seven data types (one-, two-, three-dimensional data, temporal and multi-dimensional data, and tree and network data) and seven tasks (overview, zoom, filter, details-on-demand, relate, history, and extracts).

> Everything points to the conclusion that the phrase 'the language of art' is more than a loose metaphor, that even to describe the visible world in images we need a developed system of schemata.

E. H. Gombrich *Art and Illusion*, 1959 (p. 76)

1. Introduction

Information exploration should be a joyous experience, but many commentators talk of information overload and anxiety (Wurman, 1989). However, there is promising evidence that the next generation of digital libraries for structured databases, textual documents, and multimedia will enable convenient exploration of growing information spaces by a wider range of users. Visual language researchers and user-interface designers are inventing powerful information visualization methods, while offering smoother integration of technology with task.

The terminology swirl in this domain is especially colorful. The older terms of information retrieval (often applied to bibliographic and textual document systems) and database management (often applied to more structured relational database systems with orderly attributes and sort keys), are being pushed aside by newer notions of information gathering, seeking, or visualization and data mining, warehousing, or filtering. While distinctions are subtle, the common goals reach from finding a narrow set of items in a large collection that satisfy a well-understood information need (known-item search) to developing an understanding of unexpected patterns within the collection (browse) (Marchionini, 1995).

Exploring information collections becomes increasingly difficult as the volume grows. A page of information is easy to explore, but when the information becomes the size of a book, or library, or even larger, it may be difficult to locate known items or to browse to gain an overview.

Designers are just discovering how to use the rapid and high resolution color displays to present large amounts of information in orderly and user-controlled ways. Perceptual psychologists, statisticians, and graphic designers (Bertin, 1983; Cleveland, 1993; Tufte, 1983, 1990) offer valuable guidance about presenting static information, but the opportunity for dynamic displays takes user interface designers well beyond current wisdom.

2. Visual Information Seeking Mantra

The success of direct-manipulation interfaces is indicative of the power of using computers in a more visual or graphic manner. A picture is often cited to be worth a thousand words and, for some (but not all) tasks, it is clear that a visual presentation—such as a map or photograph—is dramatically easier to use than is a textual description or a spoken report. As computer speed and display resolution increase, information visualization and graphical interfaces are likely to have an expanding role. If a map of the United States is displayed, then it should be possible to point rapidly at one of 1000 cities to get tourist information. Of course, a foreigner who knows a city's name (for example, New Orleans), but not its location, may do better with a scrolling alphabetical list.

0-8186-7469-5/96 $05.00 © 1996 IEEE

What makes a successful analytic dialogue?

TABLE 1: Taxonomy of interactive dynamics for visual analysis

Data & View Specification	**Visualize** data by choosing visual encodings. **Filter** out data to focus on relevant items. **Sort** items to expose patterns. **Derive** values or models from source data.
View Manipulation	**Select** items to highlight, filter, or manipulate them. **Navigate** to examine high-level patterns and low-level detail. **Coordinate** views for linked, multi-dimensional exploration. **Organize** multiple windows and workspaces.
Process & Provenance	**Record** analysis histories for revisitation, review and sharing. **Annotate** patterns to document findings. **Share** views and annotations to enable collaboration. **Guide** users through analysis tasks or stories.

Heer, J., Shneiderman, B. 2012. “A taxonomy of tools that support the fluent and flexible use of visualizations”.

The Craft of Information Visualization (2003)

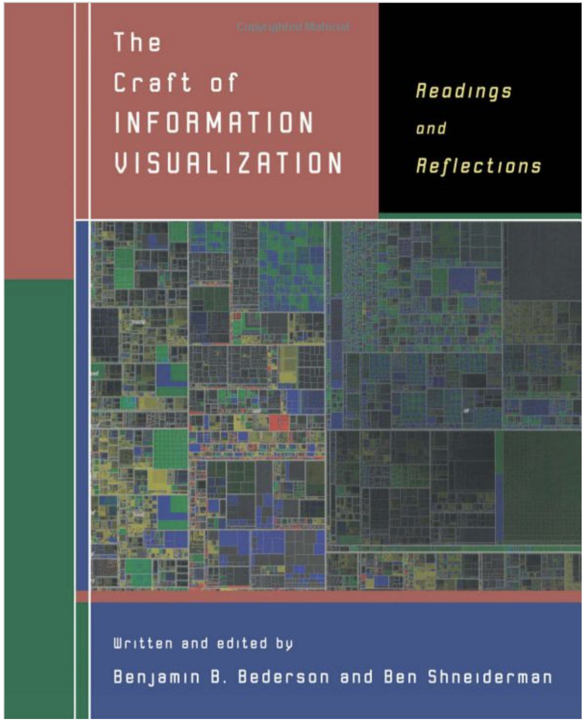
[Link to the Google Book]

Published April 23, 2003

Authors

- Benjamin B. Bederson
    - Computer Science professor at the University of Maryland
    - Director of the Human-Computer Interaction Lab at UMD

- Ben Shneiderman

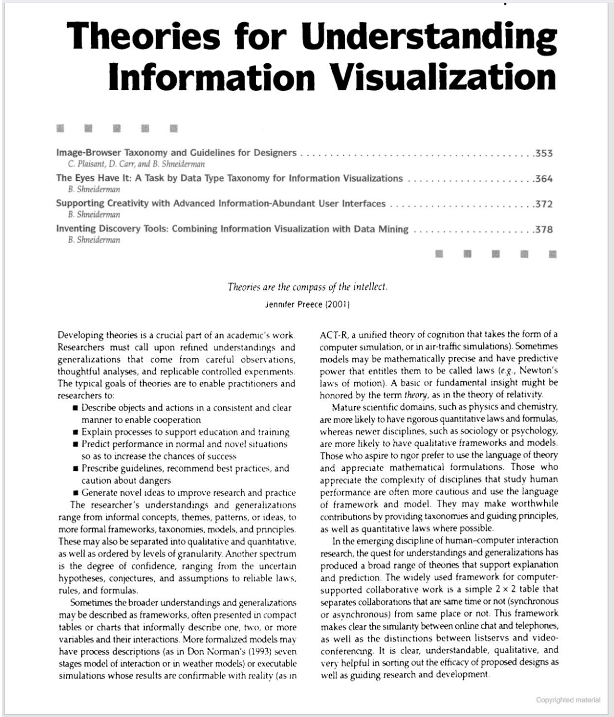


“Theories for Understanding Information Visualization”

“The typical goals of theories are to enable practitioners and researchers to:

- **Describe** objects and actions in a consistent and clear manner to enable cooperation
- **Explain** processes to support education and training
- **Predict** performance in normal and novel situations so as to increase the chances of success
- **Prescribe** guidelines, recommend best practices, and caution about dangers
- **Generate** novel ideas to improve research and practice.”

Excerpt from pages 349-351 of *The Craft of Information Visualization* (2003)



Theories for Understanding Information Visualization

Theories are the compass of the intellect.

Jennifer Preece (2001)

Developing theories is a crucial part of an academic's work. Researchers must call upon refined understandings and generalizations that come from careful observations, thoughtful analyses, and replicable controlled experiments. The typical goals of theories are to enable practitioners and researchers to:

- Describe objects and actions in a consistent and clear manner to enable cooperation
- Explain processes to support education and training
- Predict performance in normal and novel situations so as to increase the chances of success
- Prescribe guidelines, recommend best practices, and caution about dangers
- Generate novel ideas to improve research and practice

The researcher's understandings and generalizations range from informal concepts, themes, patterns, or ideas, to more formal frameworks, taxonomies, models, and principles. These may also be separated into qualitative and quantitative, as well as ordered by levels of granularity. Another spectrum is the degree of confidence, ranging from the uncertain hypotheses, conjectures, and assumptions to reliable laws, rules, and formulas.

Sometimes the broader understandings and generalizations may be described as frameworks, often presented in compact tables or charts that informally describe one, two, or more variables and their interactions. More formalized models may have process descriptions (as in Don Norman's (1993) seven stages model of interaction or in weather models) or executable simulations whose results are confirmable with reality (as in ACT-R, a unified theory of cognition that takes the form of a computer simulation, or in air-traffic simulations). Sometimes models may be mathematically precise and have predictive power that entitles them to be called laws (*e.g.*, Newton's laws of motion). A basic or fundamental insight might be honored by the term *theory*, as in the theory of relativity.

Mature scientific domains, such as physics and chemistry, are more likely to have rigorous quantitative laws and formulas, whereas newer disciplines, such as sociology or psychology, are more likely to have qualitative frameworks and models. Those who aspire to rigor prefer to use the language of theory and appreciate mathematical formulations. Those who appreciate the complexity of disciplines that study human performance are often more cautious and use the language of framework and model. They may make worthwhile contributions by providing taxonomies and guiding principles, as well as quantitative laws where possible.

In the emerging discipline of human–computer interaction research, the quest for understandings and generalizations has produced a broad range of theories that support explanation and prediction. The widely used framework for computer-supported collaborative work is a simple 2 × 2 table that separates collaborations that are same time or not (synchronous or asynchronous) from same place or not. This framework makes clear the similarity between online chat and telephones, as well as the distinctions between listservs and video-conferencing. It is clear, understandable, qualitative, and very helpful in sorting out the efficacy of proposed designs as well as guiding research and development.

Relating to Other Authors in the Class

Rogers, Y. 2012. *HCI Theory.* Chapter 3. Pages 16-17.

Bederson and Shneiderman (2003), for example, suggest that there at least five kinds of theories we should be *aiming* for using in HCI. These are:

- **descriptive** - in the sense of providing concepts, clarifying terminology and guiding further inquiry;
- **explanatory** – in the sense of explicating relationships and processes;
- **predictive** – enabling predictions to be made about user performance;
- **prescriptive** – providing guidance for design;
- **generative** – in the sense of enabling practitioners to create or invent or discover something new.

Kaptelinin, V., & Nardi, B. 2006. *Acting with Technology.* Chapter 2. Page 28.

Shneiderman (2002) identified five types of roles and uses of theories (which are not mutually exclusive): (1) descriptive theories identify key concepts or variables and make basic conceptual distinctions; (2) explanatory theories reveal relationships and processes; (3) predictive theories, such as Fitts' Law or GOMS, make it possible to make predictions about performance in a range of potential contexts; (4) prescriptive theories provide guidelines based on best practice; and (5) generative theories facilitate creativity, invention, and discovery.

“8 Golden Rules of Interface Design”

1. Strive for consistency.

2. Enable frequent users to use shortcuts.

3. Offer informative feedback.

4. Design dialog to yield closure.

5. Offer simple error handling.

6. Permit easy reversal of actions.

7. Support internal locus of control.

8. Reduce short-term memory load.

Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., and Elmqvist, N., Designing the User Interface: Strategies for Effective Human-Computer Interaction: Sixth Edition, Pearson (May 2016) http://www.cs.umd.edu/hcil/DTUI6

Introduction to our Wikipedia contribution

The Craft of Information Visualization: Readings and Reflections, 2003 [edit source]

In 2003, Ben Bederson and Ben Shneiderman coauthored the book "The Craft of Information Visualization: Readings and Reflections." Included in Chapter 8: Theories for Understanding Information Visualization in this book are five goals of theories for HCI practitioners and researchers, which read:

> The typical goals of theories are to enable practitioners and researchers to:
>
> 1. Describe objects and actions in a consistent and clear manner to enable cooperation
> 2. Explain processes to support education and training
> 3. Predict performance in normal and novel situations so as to increase the chances of success
> 4. Prescribe guidelines, recommend best practices, and caution about dangers
> 5. Generate novel ideas to improve research and practice."[13]

These goals are frequently taught in courses on Human-Computer Interaction and cited in works by authors such as Yvonne Rogers, Victor Kaptelinin, and Bonnie Nardi.

Taxonomy of interactive dynamics for visual analysis, 2012 [edit source]

In 2012, Jeffrey Heer and Ben Shneiderman coauthored the article "Inactive Dynamics for Visual Analysis" in Association for Computing Machinery Queue vol. 10, no. 2. Included in this article is a taxonomy of interactive dynamics to assist researchers, designers, analysts, educators, and students in evaluating and creating visual analysis tools. The taxonomy consists of 12 task types grouped into three high-level categories, as shown below.

Data & View Specification	**Visualize** data by choosing visual encodings. **Filter** out data to focus on relevant items. **Sort** items to expose patterns. **Derive** values or models from source data.
View Manipulation	**Select** items to highlight, filter, or manipulation them. **Navigate** to examine high-level patterns and low-level detail. **Coordinate** views for linked, multi-dimensional exploration. **Organize** multiple windows and workspaces.
Process & Provenance	**Record** analysis histories for revisitation, review, and sharing. **Annotate** patterns to document findings. **Share** views and annotations to enable collaboration. **Guide** users through analysis tasks or stories.

[24]

Connecting with Ben–to be continued?

Ben Shneiderman
Professor at University of Maryland

supports Spotfire! We were just reading about your relationship as a professor of the founder of Spotfire--and even though we don't directly support that team, the connection with them is wonderful.

Let us know if you might have time for a little chat? My classmates on the team are Kyle Thomas and Bella Chiu.

Regardless, thank you so much for all of your wonderful contributions to HCDE. It's great to learn about you and your work!
best,
Dinah Coops

TODAY

Ben Shneiderman • 2:42 AM
Hi Dinah, thanks for reaching out. I'd like to learn more.
I'm traveling in Patagonia till January 24 so let's pick it up then.
Do you have a deadline? Ben

Ben Shneiderman & TIBCO Spotfire

- Shneiderman is the founding director (1983-2000) of University of Maryland's Human-Computer Interaction Laboratory (HCIL)
- Early applications of dynamic queries were built at the HCIL
- Christopher Ahlberg was a visiting student to HCIL from Sweden (‘91-’92)
    - Founded Spotfire as an independent company in 1996
- Spotfire: a leader in visual data mining and information visualization
    - Ben Shneiderman participated in the formation of Spotfire and was on its Board of Directors 1996-2001
- Fun fact: Dinah & Kyle work at TIBCO (and didn’t know about Ben)

Thank you! Questions?