WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

# The Design of Complexity

## 22 July 2013, MIT, Cambridge

### Context

This session explored how design can help us to understand and manage complexity. More than 60 participants attended and focused on the intersection between networks, economic complexity, visualizations and development. It included presentations from renowned academics and visualization artists, a workshop on identifying a common language to visualize interconnections and networking on several interactive visualizations.

Hosted within the broader context of the Links 2013 conference at The MIT Media Lab, Professor Cesar Hidalgo (from the Global Agenda Council on Design & Innovation) and Adam Bly (the Global Agenda Council on Complex Systems) hosted the event. This workshop is part of a series of interactive sessions which highlight the links between design, innovation and critical global issues. More information can be found at yourdesignthinking.com.

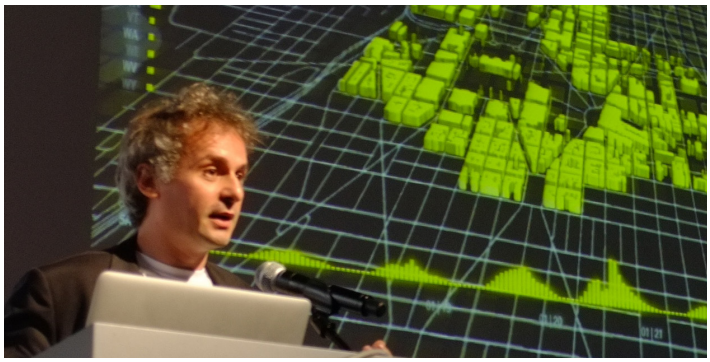
### Speaker Insights

Fernanda Viégas and Martin Wattenberg, Lead, "Big Picture" visualization research group, Google
Viégas and Wattenberg seek news ways of using data to tell stories that cannot easily be expressed. One approach was to map the top-trending YouTube videos by location, age and gender. Their visualization demonstrated that despite the diverse and hyper-fragmented content of YouTube, in many ways people pay attention to the same things but not at the same time.

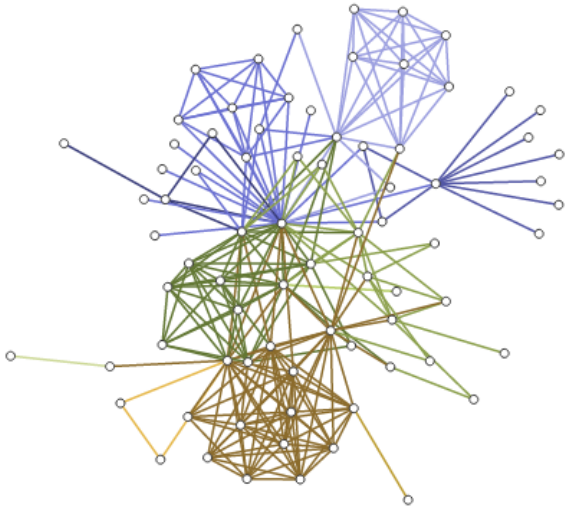
A second visualization, the wind map, was an effort to visualize the real-time movements of the wind, with an emphasis on design and aesthetics, in a way that makes the invisible visible. The speakers shared that despite its emphasis on being an artistic exercise, the wind map has been used in preventing wild fires, spraying crops and predicting tornados. This visualization has been recognized by the Museum of Modern Art for its elegance and simplicity in rendering a complex system accessible.

Manuel Lima, Senior UX Design Lead, Microsoft
This presentation took an historical perspective and reminded participants that the current "Data Deluge" is not new. The advent of the printing press 800 years ago brought a similar explosion of knowledge: new insights were shared; new ways of organizing knowledge were developed; and new visualization techniques emerged. Trees became one of the most powerful visual metaphors of that time. They were used as religious metaphors, as ways of portraying biological systems and organizing knowledge. By creating order and symmetry in presenting complex information, individuals were able to access insights and apply them in a variety of contexts. However, trees are no longer sufficient in portraying today's complexity of information. The network visualization will replace the tree, and the challenge is to find a way of showing how everything is interconnected.


Jessika Trancik, Assistant Professor of Engineering Systems, MIT
Trancik proposed the notion that we need to understand the relationship between ever-changing technologies and improving the way we work and to acknowledge that these improvements come at a price. When calculating the cost, it is important to take into account that the higher the number of people involved in a technological change, the slower will be the rate of improvement. The tool showcased during the presentation was applied to energy systems and to help policy-makers evaluate the environmental impacts and costs of energy technologies, with the aim of accelerating the development of key enabling technologies.



Mauro Martino, Research Scientist, Center for Innovation in Visual Analytics (CIVA), Watson Research Center, IBM
With so many dimensions and variables associated with the notion of big data, it is important to note that there may not be any single model that can capture all of richness. It's too big. We need to filter or simplify the information into a shared vocabulary so that problems of categorization, relationships and complexity can be more easily understood. Visualizations are crucial in this process. By interacting with the visual model, people start to grasp the broader issue and its complexity. When using a visualization model, one need to keep in mind that the model plays an important role in how the data is interpreted; to some extent the model changes the data.



## Workshop Insights

Coupled with mathematics and science, design can be a powerful tool for making sense of the increasing complex world. Seed Scientific hosted a workshop to explore how policy-makers, business leaders and the public perceive and interpret fundamental network visualization "variables" (such as colour, stroke width, physics) within the context of complex systems. Participants were presented with a series of networks, each exploring a single design "variable," and were asked to note what design change they observed and what meaning they associated to that change.

Responses revealed that without a key or another informational framework, the interpretation of visual variables was inconsistent, suggesting that the public had varying baseline literacy of network visualization. Also, variables that could have been considered more sophisticated or complex — such as motion as opposed to colour — were the least understood but also the most compelling, suggesting the ability of variables that affect the physics of a system to help an audience understand. The impulse to impose narratives on the systems or interpret a greater pattern or order was also observed. The participants who were the most visually literate in complexity better perceived changes in the systems and questioned the context of these changes. In a short discussion that followed, participants explored how these insights could prepare policy-makers to further explore complexity and to help designers better visualize complexity.

## Outcomes

This session is part of a series of interactive discussions by the Global Agenda Council on Design & Innovation. The other discussions which have, and will, take place within this framework are Design, Innovation and Education, which took place in New York on 5 November 2012; Design for Smart Growth, which will take place in Copenhagen on 31 August 2013; and Design, Innovation and Urbanization in Tokyo, on 17 October 2013. The outcomes will feed into the conclusions by the Global Agenda Council on Design & Innovation on how design and innovation can be used as tools to address critical global issues. More information will follow at yourdesignthinking.com. The outcomes of the MIT workshop led by Adam Bly will contribute to the efforts of Seed Scientific as well as the Global Agenda Council on Complex Systems developing a common language for visualizing interconnections. In addition, the insights from the meeting will feed into the overall work of the Hyperconnected World project of the World Economic Forum.

## Key contributors

Host and Moderator
Cesar A. Hidalgo, ABC Career Development Professor, The MIT Media Lab and Member of the Global Agenda Council on Design & Innovation

Workshop Lead
Adam Bly, Founder and Chief Executive Officer, Seed and Vice Chair of the Global Agenda Council on Complex Systems

For more information, please contact Lina Borén, Senior Associate, Network of the Global Agenda Councils, World Economic Forum by e-mail at lina.boren@weforum.org.

## List of Participants registered for The Design of Complexity and Links 2013

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| Saatvik Ahluwalia | YouthTrade |
| Yvette Alberdingk Thijm | WITNESS |
| Jordan Alexiev | Fidelity |
| Ali Almossawi | Mozilla |
| Nate Aune | Appsembler |
| Marguerite Avery | MIT Press |
| Helen Bailey | MIT Libraries |
| Christina Bain | Carr Center for Human Rights, Harvard Kennedy School |
| Roberta Baldassarre | Akamai Technologies |
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| Denise Cheng | MIT Center for Civic Media / Comparative Media Studies |
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| Megan Kelley | Fidelity |
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| Alix Lacoste | Harvard University |
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| Andrew Lee | Aetna Inc. |
| Edward Lee | Seed Scientific |
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| Nitin Nohria | Harvard Business School |
| Beth Noveck | NYU |
| Joseph O'Brien | Exceptional Lives |
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| Morgen Peers | Ground (urbanism & planning firm in launch) |
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