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TOWARD A DYNAMIC-DATA-VISUALIZATION-BASED MODEL FOR BUILDING AND STRENGTHENING COMMUNITIES

BRAD TOBER
brad@bradtober.com

Boston University, Boston,
Massachusetts, United States

Abstract
Through the contextualization of social media, emergent asynchronous dialogues, and the role of design / the designer, this position paper aims to establish both an argument and a foundation for a response to the identification of a contemporary breakdown in — and need for improved approaches to — communication and understanding among the diverse members of a greater community. Accordingly, this response takes the form of a working model that incorporates the use of interactive and dynamic data visualization to build and strengthen communities.

Keywords
Communication
Social media
Public discourse
Community building
Dynamic data visualization
Design
Interaction
Politics

1. INTRODUCTION AND MOTIVATION

Depending on whom one asks, the results of the 2016 United States presidential election were either completely shocking or highly anticipated. The same might be said of the United Kingdom's referendum, held earlier that same year, on leaving the European Union. For those supporters of the outcome in each of these scenarios, the results were a vindication of the allegedly underrepresented sentiments of each nation; for those against the prevailing position, the failure to foresee the ultimate conclusion, and adequately acknowledge it as even a remote possibility in advance (particularly in the case of the US election), only intensified the difficulty of coming to terms with it.

These examples, at a fundamental level, point to a breakdown in—and need for improved approaches to—communication and understanding among the diverse members of a greater community. This brief position paper aims to establish both an argument and a foundation for a response to this communicative need in the form of a model that incorporates the use of interactive and dynamic data visualization to build and strengthen communities.

2. CONTEXT

2.1 Social media, feeds, and algorithms

Social media platforms are arguably some of the most powerful communication tools currently employed in contemporary society. This power derives, at least in part, from prevalence—Facebook, for example, claims that nearly 1.23 billion people engaged with its service each day, on average, during the month of December 2016, with 85.2% of those users located outside of the United States and Canada (Facebook). Such an extensive user base points to more than just an equally extensive database of user-generated content—it is an indicator of the size of a potential audience for content published by Facebook-using entities other than individual users. Indeed, research has revealed that social media platforms—Facebook, in particular—are used as sources of (often political) information and news by individuals (Zúñiga et al. 2012, 320). Despite this, Facebook CEO Mark Zuckerberg has stated that Facebook is not a traditional media company, rather describing it as "a new kind of platform for public discourse" (Zuckerberg 2016).

The issue with characterizing a social media platform in the same way as a town square, for example, is the fact that many social media platforms feature the integration of a feed-based format for disseminating and highlighting new and/or updated content, whether from individuals or other sources. While an individual user can choose whether or not to follow, or receive content from, any given source, this degree of agency alone is not enough to ensure equal exposure to all content sources followed. In an effort to sift, with greater efficiency, through the increasing amount of content users engage with through social media, the role that algorithms play in curating and sequencing the content displayed to users is becoming more prominent. Thus, platforms like Facebook make educated guesses about the content users are, or may be, most interested in based on the type and level of engagement they have with other content (Backstrom 2013).

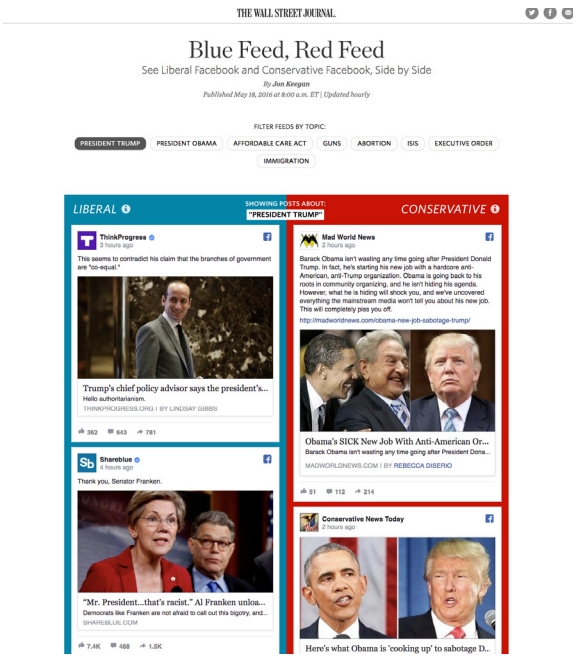

Fig. 1
Blue Feed, Red Feed
(screenshot by the author).

This increasing personalization of users' online experiences can prove problematic, however—one potential result being that "the internet's islands keep getting more segregated and soundproofed. [...] Without realizing it, we develop tunnel vision. Rarely will our Facebook comfort zones expose us to opposing views, and as a result we eventually become victims to our own biases" (El-Bermawy 2016). Many responses to this realization have taken the form of efforts to educate users about the existence and nature of the echo chambers that algorithmic news feeds can create in a political context. *Blue Feed, Red Feed*, an interactive feature by *The Wall Street Journal*, displays both liberal and conservative Facebook content related to a number of US-related political topics side-by-side (Keegan 2016). Another revelatory tool, *PolitEcho*, is an extension for the Google Chrome web browser that "calculates the political bias in the content of your news feed and compares it with the bias of your friends list to highlight possible differences between the two" (He et al. 2016).

2.2 Emergent asynchronous dialogues

Such purely educational—or diagnostic—tools can only achieve so much, as their utility stops short of proposing a functional solution to the need for improved communication. In contrast, another form of response emerged in numerous locales across the United States following the 2016 election—one that facilitated communication through assemblages of Post-it® notes prominently placed in public settings. One instance of this endeavor took place in New York City's Union Square subway station, where artist Matthew Chavez's *Subway Therapy* project "turned the wall of a 14th St. station pathway into a sounding board for the dejected to express [their] anger, confusion, and hopes for the future" (Rivoli 2016). This approach promotes a form of asynchronous discussion, as participating indi-viduals can survey the array of responses left previously before contributing their own thoughts, which may or may not build upon those of others

Emergence "refers to the arising of novel and coherent structures, patterns, and properties during the process of self-organization in complex systems" (Goldstein 1999, 49). The Post-it approach is emergent in the sense that, while simple in its essential framework, as the scale and complexity of each installation builds

over time, the approach may trend more toward communicating the overall pattern of sentiment of the surrounding community rather than solely the discrete contributions of each participating individual. This presents the opportunity for members of a community—through active (contributory) and/or passive (observatory) participation—to develop a greater understanding and appreciation of the environment in which they are situated.

Fig. 2
Matthew Chavez's *Subway Therapy* project (Rivoli 2016).

2.3 Dynamic data visualization

The need to comprehend trends and patterns points toward another, albeit broader, approach to communication—data visualization. While this term refers to "more than just representing data in a graphical form" and suggests that such a form "should aid readers or viewers in seeing the structure in the data" (Unwin et al. 2008, 6), the author proposes an extended definition that describes data visualization as a communicative tool used to reveal trends, patterns, and narratives potentially present in a given data set that might otherwise be humanly imperceptible due to the scale or complexity of the data set itself. In suggesting that data sets characterized in this way are, at least in part, the result of technology and its increasingly central role in society, the prescient words of media theorist Marshall McLuhan support this conceptualization of data visualization:

> **Electric circuitry profoundly involves [humans] with one another. Information pours upon us, instantaneously and continuously. As soon as information is acquired, it is very rapidly replaced by still newer information. Our electrically configured world has forced us to move from the habit of data classification to the mode of pattern recognition.**
> **(McLuhan et al. 1967, 63)**

Framing the type of contributed content described in the previously identified examples as raw data, it becomes clear that deriving insights from a set of such data from a community on the scale of an entire nation—but certainly one much smaller, as well—could potentially benefit from the application of data visualization techniques. Similarly, the complexity inherent to dynamic, or live/constantly changing, content necessitates an adequately responsive approach to interpreting that content in real time—particularly in situations where such content is interactively solicited in the context of the existing data (as is the case with *Subway Therapy*).

3. AN INTEGRATED MODEL

3.1 The role of design

As data visualization, in a formal sense, is concerned with visual communication, it follows that designers (and design researchers; the author carries both designations) should have a role in a model for building and strengthening communities through the application of dynamic data visualization techniques. This role is justified further in light of the outcome of the 2016 US election, when many designers contemplated how design can and should continue to act as an agent of societal impact. Perhaps most relevant to this discussion is executive director of the New York City Public Design Commission Justin Garrett Moore's call for design to embrace, enable, and support the "revolutionary act of knowing others" (Miller 2016).

Meta-design

Designers cannot engage in this "revolutionary act" on the behalf of others; however, they can investigate and pursue the development of systems and frameworks that might be ideally positioned to facilitate such an act. This coincides with the emerging role of the meta-designer; interpreted literally, one who designs (the process[es] of) design. More generally, the concept of meta-design can be framed as a response to the increasing democratization of technology — particularly those technologies with which designers previously had some degree of an exclusive relationship. Design writer and critic Andrew Blauvelt notes:

> **Today's world of open source computing, social networking, crowdsourcing, user-generated content, app store platforms, and other manifestations of the participatory culture of Web 2.0 suggest systems that are more radically open in nature, soliciting input from and empowering creation by many users. Although the rhetoric of decentralized authority pervades these endeavors, the question of control [...] (and design's role in it) lingers. It is not simply a question of no control or no design, but rather a question of where control and design happen in an open system. (Blauvelt 2013, v)**

In effect, meta-design responds to this question by shifting the designer's role from that of executing processes in which the objective is producing finalized (creative) output to engaging directly with the development of tools facilitating the (creative) processes of others.

3.2 Visualizing communities

A community can be defined by five core elements — locus (physical location), sharing (common interests, perspectives, and issues), joint action (doing things together and / or for the greater good), social ties (interpersonal relationships), and diversity (social complexity in a broad sense) (MacQueen et al. 2001, 1930). Accordingly, the author proposes that the building and strengthening of communities can occur through the implementation of a

particular approach to dynamic data visualization — one that communicates (and thus facilitates the greater understanding of) data representative of, or otherwise fundamentally engages aspects related to, each of these elements.

Physical installation

The visualization of data in this proposed model should not be exclusive to the divisive and small individual screens that serve as portals into the virtual world. Rather, the building and strengthening of a community through dynamic data visualization must happen from within the community itself. For this reason, a visualization effort following the proposed model may take the form of a large-scale interactive experience physically installed at a central location in a community. In this way, the proposed model more authentically, relative to social media, realizes a platform for public discourse analogous to a town square. This focus on a physical installation addresses the community elements of locus and joint action; the installation establishes a spatial reference point for community members to associate with the community, and the visibility of community members' (either active or passive) engagement with the installation allows for individuals, in much the same way as with *Subway Therapy*, to relate their deliberate actions to those of their neighbors.

Real-time responsiveness

The interactive aspect of the installation approach associated with the proposed model might be reflected in the way that participating community members are solicited for input in response to a varied range of data prompts. These prompts could take the form of constructed questions (as a somewhat superficial example, it might be determined that visualizing the community's response to the question "Do you prefer cats or dogs?" would provide valuable insight into the sentiment of the community) or as broader statements to which more open-ended reactions would be desired.

However, the specific characteristics of the data values collected are not as consequential as what is done to interpret the set of values as a whole. In order to emphasize the community elements of sharing and social ties, this interpretation must occur in real time and the visualization must feature a high degree of responsiveness to the input of community members. The proposed model argues that by having the visualization reflect (an interpretation of) the current state of the system and its data at all times, participants engaged with installation are able to contextualize their contributions within those of the collective (or subsets thereof), and thus potentially strengthen relationships with other individuals participating at the same time in the same physical location.

Curation by humans

While the determination of a specific framework for developing data prompts appropriate to the proposed visualization model is beyond the scope of this particular paper (but, indeed, is a critical next step in the research process), one characteristic essential to the process of developing, selecting, presenting, and interpreting the data collected from these prompts is the sensi-

bility of human curation. This is in stark contrast with the reliance on algorithms inherent to many interfaces to social media content. By focusing on a prominent human role in deciding not only what data is displayed by the visualization, but what type of data is solicited in the first place, the proposed model aims to more explicitly ensure collective representation, and thus reflect the community element of diversity. The act of curation could potentially be facilitated by a small, but representative, panel of community members responsible for making such decisions, or might be implemented through a larger-scale crowdsourced voting approach similar to those employed by content aggregation websites like Reddit.

Of course, the issue with crowdsourcing implementations like Reddit's is their reliance on algorithms to prevent cheating and other forms of vote manipulation (Slowe 2016).

Fig. 3
Reddit users vote on posted content using arrow controls (screenshot by the author).

4. POTENTIAL APPLICATION

The argument and foundation for a dynamic-data-visualization-based model for building and strengthening communities established in this paper aims to support the initiation, incubation, and implementation of a project at a major research university located in a large (and densely populated) metropolitan area in the United States. Notably, the author's interest in this research topic arose, in part, out of personally experiencing instances of the post-election Post-it installation approach, inspired by *Subway Therapy*, in both the city's transit system and on the university's campus.

Initial investigations of potential hardware for implementing an installation based on the proposed model have pointed to Google's exemplar of its AnyPixel.js "open-source software and hardware library that makes it possible to use the web to create big, unusual, interactive displays out of all kinds of things" (Google 2016). Located in the lobby of Google's New York City office, the exemplar installation uses 5880 arcade buttons, each with an RGB LED, as the interactive pixels of the display. Part of the intrigue of AnyPixel.js—particularly in terms of exploring its implications for interaction design—is that, to the knowledge of the author at the time of this writing, there have been no publicly published third-party implementations of the library. The author's discussions with colleagues regarding potential collaboration on such a project have revealed a great deal of interest, particularly related to opportunities involving the research and development of methods for evaluating the effectiveness of approaches to building and strengthening communities—both according to the proposed model and otherwise.

Additional interest has been expressed in connection with investigating the potential scalability of the proposed model; that is, determining both the

range of community sizes for which the proposed model might be applicable and its degree of functionality in non-civic (corporate or business) community contexts.

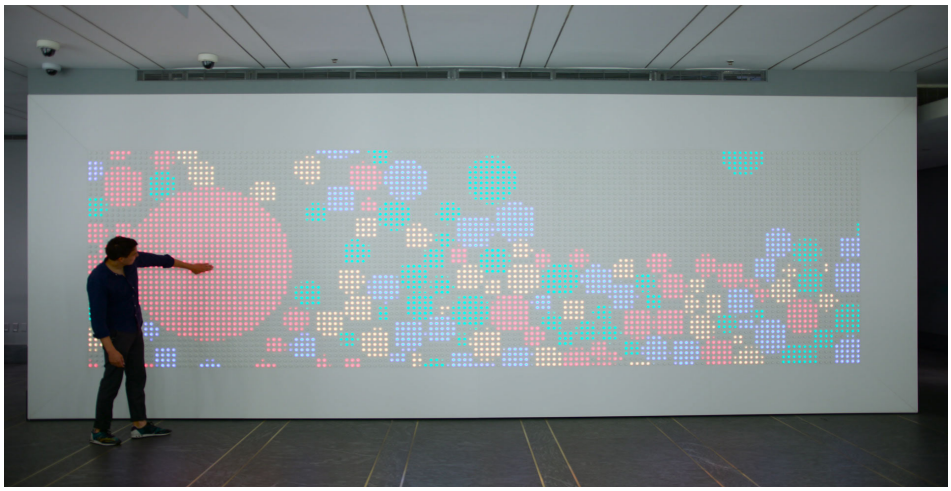

Fig. 4
Google's exemplar installation of AnyPixel.js (Google 2016).

5. CONCLUSION

The proposed model for an approach to dynamic data visualization that aims to build and strengthen communities described in this paper is incomplete, but initial investigations have discovered both the potential need for and support of such a model. Furthermore, the particular characterization of a community through the five elements of locus, sharing, joint action, social ties, and diversity provides a framework that maps to the three preliminary model attributes of physical installation, real-time responsiveness, and human curation. Perhaps most consequentially, however, is that this paper has established a working context for the pursuit of the project alluded to briefly in the prior section—and endeavor that the author is committed to advancing and sharing with the audience at a later date.

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