5. The practice and politics of migration data visualization

William Allen

Abstract

Data visualization aims to enhance understanding and communication of key insights deriving from primarily quantitative sources. While prior scholarship has focused on the technical aspects of how to visualize data, recent interest has turned to understanding the political and social dimensions of visualization. This chapter aims to outline major aspects of the practice and politics of data visualization. After introducing a typology informed by design practice that expresses how a visualization's audience and purpose contribute towards its eventual form, I apply this typology to several migration visualizations. Then, I consider how visualizations—as well as the technologies and design processes underpinning them—represent and generate new forms of data politics. As a result, I argue these open new questions about how, for whom, and in which circumstances data visualization matters in the domain of migration and mobility.

Keywords:

data politics; data visualization; knowledge brokerage; political communication

INTRODUCTION

Recent computational advances have provided social scientists with a variety of new tools and techniques. One of those tools is data visualization, comprising a wide range of visual outputs that aim to enhance both understanding and communication of key patterns and insights emerging from primarily, though not exclusively, quantitative sources of information. Although the practice of visualization may not be new, the forms it now takes in the age of Big Data, unprecedented computational capabilities, and technologies that bring visualization within reach to greater numbers of people have certainly changed.

Some argue that we visualize data to save time in making sense of huge volumes of varied information (Chen, Floridi, and Borgo 2014). In some senses, this would be correct: visualization's efficiency over conventional tabular presentations of data is undeniable. But such a simplistic and exclusive view potentially obscures deeper questions not only about *why* data visualization is perceived to be so powerful, but also *how*, *for what purposes*, and *in which circumstances* this power is expressed.

My central argument in this chapter is that the visualization of data—particularly in the domain of migration and mobility—is inextricably linked with questions of data politics. By bringing together examples from my own work as well as collaborative projects with colleagues, I aim to illustrate the value of, and need for further discussion about the practice and politics of visualization. I make my case in three parts. First, I outline what I mean by data visualization, and introduce a typology of visualization from the world of design practice that illustrates how there is no single "right" way to visualize, but rather a range of options that emerge from decisions about the audience and purpose of a visualization. Second, I present some exemplars to illustrate contemporary approaches to visualization involving migration data, linking these outputs to the broader typology introduced earlier. Third, I consider how these visualizations both represent and generate new kinds of politics—what some call "data politics" (Bigo, Isin, and Ruppert 2019)—that are worth investigating further.

To be clear, this is not a methodological chapter that covers how to make visualizations. For readers interested in this aspect of data visualization, there are excellent resources from social science (Healy 2018) and design perspectives (Kirk 2019) that offer guidance in a step-by-step fashion, as well as overviews of available software and techniques with discussion of their advantages and limitations (Gatto 2015; Healy and Moody 2014; Kennedy and Allen 2017). Instead, my goal is to illustrate how data visualization as a set of practices, actors, and technologies raises political questions with implications for how diverse groups make sense of migration and mobility.

WHAT IS DATA VISUALIZATION?

From historical roots to contemporary uses

Visuals have been central to science communication throughout history (Bucchi and Saracino 2016). In this chapter, I am focusing on one particular type of visual object: the data visualization. Defined by Andy Kirk, a leading visualization designer, as "the visual representation and presentation of data to facilitate understanding" (Kirk 2019, 15), data visualization is often associated with seemingly straightforward—if numerous—design choices such as selecting colors, arranging shapes, and distinguishing among typefaces. Of course, these are important aspects of visualization practice that undoubtedly contribute to the ways and likelihood that people engage with a chart or graph (Kennedy, Hill, Allen, et al.

2016). But visualization is more than just about producing attractive and well-designed visual outputs. Rather, it involves multiple processes and contributors that exist within particular social, cultural, technological, and political contexts. This is even more the case for *data* visualizations which—unlike infographics, flowcharts, or other more illustrative outputs—have some basis in forms of quantitative information that are themselves generated in particular circumstances.

Edward Tufte (1983; 2006) is probably one of the most well-known authors on visualization. His work and legacy have heavily contributed to received wisdom about what makes "effective" data visualizations, much of which still remains relevant and continues to feature in current guidelines (Kelleher and Wagener 2011). Two characteristics in particular, clarity and simplicity, stand out as being especially important for visualization: the data and their associated meanings should be given the greatest priority, not so-called "chartjunk" that potentially distract and confuse readers (Wainer 1984). Although this is probably still good advice in general, it does raise the observation that what is clear or simple for one type of reader or context may not be suitable or appropriate in other settings. For example, the editorial team at the scientific journal *Nature* recognizes that both specialists and non-specialists may engage with its visual outputs, and therefore its visualization practice must align with an article's intended audience (Krause 2017). What is more, new technologies—including digital platforms and data collection methods—add greater complexity to the construction and communication of visualization. This is a point I will return to in the second part of the chapter.

As a result, current scholarship increasingly acknowledges how data visualizations, just like the various forms of data on which they are based (boyd and Crawford 2012), are "multifaceted and 'multitruthed'" (Welles and Meirelles 2015, 37). They are not neutral windows onto self-evident patterns within data. Rather, through the actions of anyone handling data as well as the affordances of technologies themselves, visualizations can transform, frame, or shape understanding of the concepts or populations represented by and in datasets (Hullman and Diakopoulos 2011). Intentionally or not, these transformations and framings can prioritize certain values and ideologies over others not only through explicit features such as titles but also through unspoken features such as design conventions (Kennedy, Hill, Aiello, et al. 2016) and software settings that may determine what data are sampled or included in the visualization in the first place (Kitchin and Lauriault 2015).

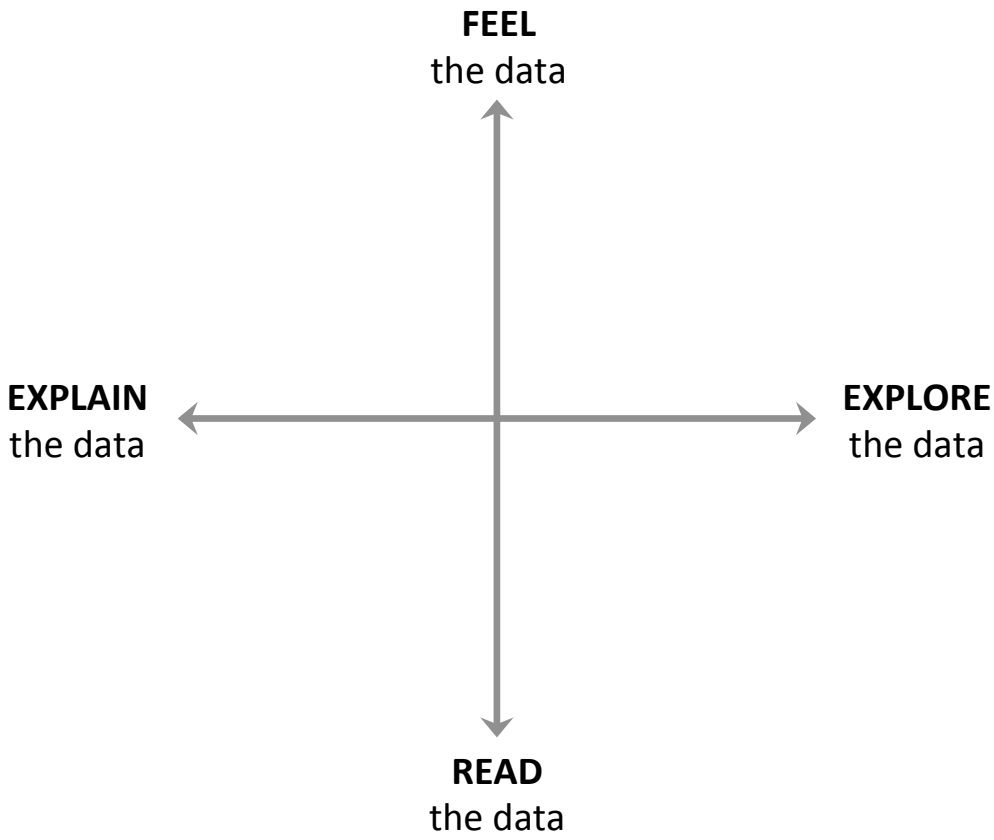
Distinguishing among visualization types and purposes: explaining versus exploring, reading versus feeling

If data visualization has such potential power, how can we make sense of for whom and in which circumstances this might happen? Kirk (2019) provides a helpful analytical tool for understanding the variety of options that designers can use when visualizing data, and what these imply for intended audiences and communication purposes. Summarized in Figure 5.1, he argues visualizations have two main dimensions: on the one hand, outputs that aim to either *explain* key patterns in the data or enable readers to *explore* the data following their own curiosities or interests; and the other hand, outputs that either facilitate *reading* data for particular values or *feeling* overall patterns in an impressionistic way.[1] Of course,

[1] Kirk includes "exhibiting" data as a third category between "explain" and "explore." In his words, exhibitory visualizations are "visual displays of data" where "the viewers have to do the work to interpret meaning relying on their own capacity to perceive and translate the features of a visualisation" (Kirk 2019, 86). In my summary, I have omitted this category for simplicity. Also, while he is not the first to make the explain-explore distinction in reference to data

visualizations might occupy several places along these axes simultaneously, especially if they are interactive objects with multiple layers of visualizations. Yet this simplified grid is a useful way of generating some archetypical visualizations to draw out their implications for audiences and usages.

Figure 5.1. A typology of data visualization based on Kirk (2019)



For example, some charts might make specific claims from a dataset by highlighting individual values distinguished by time period, population type, or geographic region. These kinds of visualizations, demonstrating characteristics that are closer to the "explain" and "read" categories, might include official censuses or government statistical offices. This is in contrast to other visualizations that may use strong visual metaphors while allowing viewers to independently dig into the chart and its data—approaches that would be closer to the "explore" and "feel" categories.

From a design perspective, where visualizations lie on these axes depends on their purposes and audiences. Explanatory visualizations would suit situations where a clear message is involved, whereas exploratory visualizations would be better in settings where the aim is to demonstrate multiple possible conclusions rather than advancing particular claims, especially on partisan issues. Meanwhile, the ability to read data from visualizations may be useful for subject specialists or in situations where the message involves comparing discrete values. However, when audiences might benefit from having an overall impression of a dataset's key

visualization (Healy and Moody 2014; Welles and Meirelles 2015), Kirk's addition of the read-feel dimension (what he calls the "tone" of a visualization's design) contributes important insight from visualization practice.

trends without a need for picking out individual datapoints, the ability to feel the data could be much more valuable.

It is important to emphasize this typology is an idealized way of organizing the variety of possible options for visualizing data. Since it is meant to serve as a guide, it does not make normative claims about whether some ways of visualizing are preferable over others. Of course, there are some features that are universally viewed as improving visualization practice, notably advances in accessibility through the use of colorblind-safe palettes. On a conceptual level, visualizations are more successful when there are clear links between the chart types used and the "story" being told through the data at hand, whether that is some kind of change over time, differences among groups, or deviations from a norm. To make these links clearer, the visualizer Alan Smith (2019) created a "visual vocabulary" which is a useful guide that shows how some chart types are better at conveying certain kinds of data, or patterns within the data to be more precise. In the next section, I provide examples of visualization involving human migration and mobility that illustrate these approaches.

DATA VISUALIZATION IN MIGRATION AND MOBILITY DOMAINS

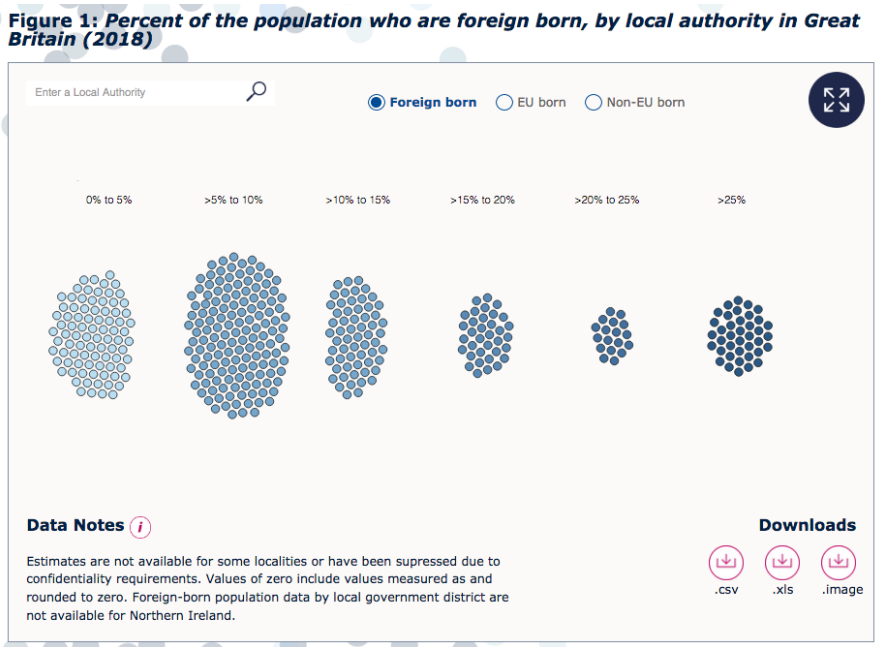
A recent review observed how new advances in digital technologies have afforded researchers working in migration studies the abilities to "interrogate and visualise the spatial, temporal and interaction components of migration data in ways which were hitherto impossible" (Dennett 2015, 143). It goes on to argue these visualizations have obvious appeal across a variety of audiences including "a policymaker with a government to inform, an academic with research to conduct, or a journalist with an article to write" (Dennett 2015, 152). But how and why? Using the previous typology of visualization practice, I disentangle these different usages to draw attention to the ways that visualization can support—and complicate—each set of efforts. This is not meant to be a comprehensive survey of all migration visualizations. Rather, I have chosen examples that demonstrate how migration data can be visualized for different purposes and with different audiences in mind.

Making sense of migration data and trends

The first set of tasks is mostly diagnostic and analytical, where the main questions of interest are likely to be descriptive ones. How many people are moving? To and from where? Over what time periods—and are these patterns changing? These kinds of questions likely demand the ability to read specific values, as well as explore a dataset without predetermined specifications.

An example of this kind of visualization is the "Local Data Guide" produced by The Migration Observatory at the University of Oxford and available at https://dataguide.migrationobservatory.ox.ac.uk. Based on local level data produced by the UK's Office for National Statistics and National Records Scotland, this set of interactive visualizations is comprehensive and detailed, providing a great deal of information in a non-directed way. As demonstrated in the screenshot displayed in Figure 5.2, users can search the dataset for particular local authorities, choose to focus on particular subgroups, and download the customized visualization for their own use.

Figure 5.2. Screenshot of the Local Data Guide produced by The Migration Observatory



Another example involving static (i.e., non-interactive) visualizations comes from the World Migration Report, published by the International Organization for Migration (IOM). Across two chapters covering both global and regional migration data, a variety of charts comprehensively depict patterns of mobility subdivided into key categories including gender, reason for migration, and countries of origin (IOM 2019a; 2019b). They also present these figures as both gross levels and proportions to provide additional context for the statistics. Finally, in an effort to move beyond dominant themes and interests, the visualizations include data on emigration as well as how some countries receive and host large numbers of refugees. By providing details that might otherwise be overlooked or lumped together under broad categories of "migrants" and "refugees," these charts illustrate the complexities of mobility patterns.

Communicating migration data to public audiences

Another approach to data visualization involves using it to communicate key messages to non-expert audiences in settings where messengers might want to raise public awareness of particular migration issues or directly correct misperceptions and incorrect beliefs. In these situations, often but not exclusively in the realms of journalism and advocacy work, designers could turn to emotional appeals and figurative imagery rather than detailed data to make specific points—techniques that are closer to explaining and feeling data.[2]

Roopika Risam (2019) examines one such visualization, called "The Flow Towards Europe" and available at https://www.lucify.com/the-flow-towards-europe/. Relying on UN refugee data, it is a series of visualizations that aim "to clarify the scale of the crisis." Despite popular perceptions of huge numbers of refugees and migrants entering Europe—possibly sustained by media emphasizing the scale and pace of global migration (Allen, Blinder, and McNeil

[2] Of course, journalists may actually want readers to be able to read specific data to enhance the credibility of the story being crafted, by ascribing to perceptions that quantitative claims are more objective and scientific (Baele et al. 2017). Therefore, visualizations used in these data journalism contexts might contain elements that enable both reading and feeling data (Rall et al. 2016).

2017; Allen and Blinder 2018)—this visualization tries to make the point that the actual arrival numbers are relatively low. For example, accompanying stylized icons of soccer fields as units, the visualization displays text saying "around a million Syrian refugees have sought asylum in Europe between April 2011 and December 2017. Standing very tightly together, they would fit on 15 soccer fields." The image of a playing field—probably recognizable to most public users—combined with a large main heading emphasizing "only a fraction makes it to Europe" demonstrates how this kind of visualization aims to send a clear (possibly counterintuitive) message that provokes reactions or re-thinking of held beliefs.

Informing and enabling decision-making in policy and practice

The third set of tasks for which some types of data visualization can be useful involves informing and enabling decision-making, particularly in the worlds of migration policymaking and practice. These areas often require specific forms of evidence delivered in timely and readily-accessible ways (Oliver et al. 2014). However, specific to the migration domain which is heavily politicized in some national contexts, quantitative evidence itself can be called upon to legitimize pre-determined government positions (Boswell 2009) or lend additional credibility to civil society organizations' agendas and claims of public impact (Allen 2017a). In these settings, data visualization may take a greater role in explaining the policy implications of trends and patterns while providing avenues for both feeling the aggregate "top-line" findings as well as reading values for specific dimensions of interest.

An example of this is the IOM's Global Migration Data Portal, available at https://migrationdataportal.org/. Launched in December 2017 by the IOM's Global Migration Data Analysis Centre with the financial support of the government of Germany and the UK's Department for International Development, the portal describes itself as "a unique access point to timely, comprehensive migration statistics and reliable information about migration data globally." It contains a wide range of visualizations based on data collated from a variety of sources, displayed in a "dashboard" format that combines separate charts into one overview pane (Froese and Tory 2016). Moreover, these dashboards are highly customizable: users can generate visualizations for different countries, region, and thematic areas. Finally, text-based briefings under a tab labelled "themes" provide concise summaries of the available evidence and data for many migration-related themes, both in terms of their substantive content as well as their methodological rigor.

Although the visualizations themselves are similar in tone to the ones appearing in The Migration Observatory's Local Data Guide—exhibiting qualities that encourage users to "explore" the data by "reading" it in great detail—they take on more of an explanatory function when placed alongside the briefings which link migration data with key policy areas such as the Sustainable Development Goals (SDGs) or the Migration Governance Indicators (MGIs). This responds to the needs and priorities of users, in this case policymakers, whose interests are likely to lie in understanding the significance of national and regional trends in relation to global migration issues.

THE DATA POLITICS OF VISUALIZATION

The previous section presented a typology of data visualization to illustrate how different kinds of visualization can achieve different aims: there is no single "correct" visualization for all situations. Rather, as seen in the examples, visualization potentially speaks to multiple audiences and in multiple ways. However, this practical point has important implications for understanding the politics of data visualization—and, in relation to migration, both how

human mobility is represented and which humans are important enough to have been "counted" as being mobile in the first place (Bigo, Isin, and Ruppert 2019). In the following sections, I outline the conceptual framework of data politics. Then, I apply this concept to migration data visualization, demonstrating how seemingly straightforward design choices can potentially reflect limited or incorrect assumptions about mobility. Finally, I place visualization in its wider relational context—within networks of researchers, designers, and intermediaries—to highlight how these visual outputs are actually the "brokered" products of many hands.

Data politics and visual brokerage

Evelyn Ruppert and her colleagues have developed the concept of "data politics" to bring attention to the ways that data are "generative of new forms of power relations and politics at different and interconnected scales" (2017, 2). This concept has three key aspects: *worlds*, comprising the material infrastructures associated with the Internet and digital technologies; *subjects*, referring to the people and populations generated and governed by data; and *rights*, involving the struggles over who gets to generate and have authority over data as well as the ways those data are used (Bigo, Isin, and Ruppert 2019).

How are data politics relevant for migration studies generally, and data visualization specifically? First, migration as a subject domain is increasingly characterized by the presence and use of large-scale datasets. These include censuses (Ruppert 2011), mobile phones (Taylor 2016a), social media (Laczko 2015), and administrative data originally collected and held by governments for other purposes (Allen et al. 2018). Ambitions to more fully exploit these advances by linking data sources raise important questions about these new data subjects' privacy (Amoore 2009), as well as what kinds of responsibilities for sharing data with researchers should be borne by data collectors (Taylor 2016b).

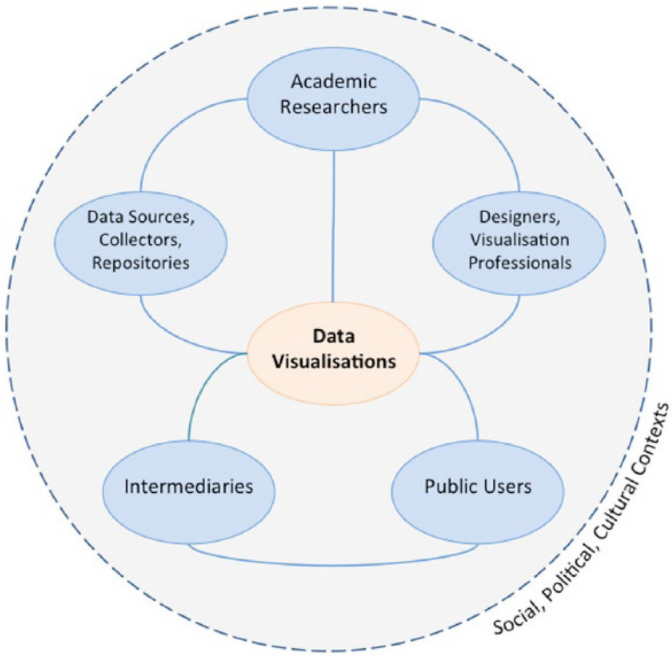
Second, data politics draw attention to what and who is missing in the processes and outcomes of visualizing migration stocks and flows: "[w]ho, for example, has the ability—the privilege—to access, use, or speak with data? How are the uses of data the products of political, social, historical, and cultural contexts and values, and to what extent do they reinforce existing hierarchies of power" (Allen 2020, 188)? These kinds of questions are especially important for signalling how creating and communicating knowledge visually can on the one hand reinforce and widen existing divides between those who have the technological resources and skills to handle data and those who do not (Appadurai 2016), while on the other hand enabling critical and compelling counter-narratives to established ways of thinking.

To be sure, much of the data that eventually is visualized is underpinned, or otherwise informed by statistics and other kinds of quantitative measures. The uses (and abuses) of statistics are instructive for understanding why the politics of visualization matters. For example, survey poll results as snapshots of public attitudes are often used for political advantage by campaigning candidates (Herbst 1995), while quantitative evidence—especially on contentious topics with little agreement on a "correct" outcome—can be used to legitimize any number of positions (Boswell 2009). Meanwhile, even though bureaucratic statistical bodies themselves may strive for impartiality as a sort of "political observatory" (Schudson 2010) above the fray of party politics, a multitude of partisan actors may likely use and repurpose those statistical outputs for their own agendas (Allen and Blinder 2018; Spiegelhalter 2017). This is not to suggest that all normative uses of statistics are unethical or somehow inherently misleading. Rather, I am simply drawing attention to the ways that

visualizations—and the data on which they are based—can be used to legitimate claims and persuade others of those claims.

Up to this point, I have largely analyzed data visualizations as objects which express data politics through representation: what (and who) features in these visual outputs matters for public understandings of consequential issues. However, visualizations also contribute to data politics in the ways that they are connected to other people, objects, and organizations—sometimes even before they take the forms of visualizations. I see them as part of a larger process of "visual brokerage" which involves "processes of conceiving, creating, interpreting, and responding to data visualisations as they occur in social, political, and cultural contexts" (Allen 2018, 907). Figure 5.3 illustrates how visual brokerage connects multiple actors as they contribute to visualization outputs. These include researchers who bring their own questions and interests (Boswell 2019), data collectors such as survey companies or national statistical offices who make technical decisions about question designs and response categories, and intermediaries such as journalists and representatives of non-governmental organizations who translate evidence for public audiences (Allen 2017b). All of these relationships exist within particular contexts that enable some possibilities while foreclosing others: for example, one aspect that is salient for migration involves the legal definitions surrounding who is counted as a "migrant" or "refugee" for the purposes of data collection and categorization. This model, read alongside the typology of visualizations, helps illustrate the wider implications of visualization beyond merely technical desires to communicate data more "effectively." Defining effectiveness, itself a multidimensional objective, is highly contingent on the audience and purpose (Kennedy, Hill, Allen, et al. 2016), while achieving effectiveness requires acknowledging how visualization is involves many hands and steps.

Figure 5.3. A model of visual brokerage (originally Figure 4 in Allen 2018)



Crucially for this chapter, each of these actors is using particular sets of technologies in the course of their work. Data collectors using satellite remote sensing, for instance, can take advantage of increasingly fine-grained imagery to trace and track human movement as well

as its impacts on physical environments. Yet analyses based on these data are directly tied to what and how these satellites "see" and report as movement (Rothe 2017). In the case of user-generated data such as on social media, automatically or semi-automatically scraping this information using an Application Programming Interface (API) may involve some trade-offs in completeness or comprehensiveness owing to APIs' idiosyncracies, which in turn can impact the scope of the conclusions (Rieder et al. 2015). Finally, when it comes to software, designers and intermediaries wanting to create and share data visualizations either for themselves or for clients in research and other sectors can now access a variety of tools, many of which are low-cost or free (Gatto 2015). Yet even as options have proliferated and arguably moved professional-quality visualization within the reach of many, there remains a need for greater understanding of how these software programs work at a technical level—particularly in terms of reshaping and transforming datasets for analysis.

EMERGING ISSUES AND FUTURE RESEARCH

This chapter outlined what data visualizations are, particularly highlighting how the forms they take (captured in a simple typology borrowed from design practice) depend on the audience and purpose of the final product. Then, it illustrated these forms by describing several exemplars within the domain of migration and mobility. Finally, it considered how both the visualizations as outputs as well as the processes surrounding their creation and communication necessarily involved many other actors, in a set of relationships called "visual brokerage" that gives rise to new forms of data politics.

The agenda for visualization research and practice continues to expand. How are these brokered objects perceived and understood by varied audiences who increasingly use a wider range of platforms to access them? What are the implications of these understandings for broader political behaviors such as voting, attitude formation, or expressing preferences for certain policies? How is the rise of crowdsourced data changing the norms of what is considered acceptable in terms of ethical practices when it comes to displaying and acting upon those data? More broadly, what kinds of assumptions, interests, and agendas are driving the sustained attention from policy and industry to data-based technologies and solutions? The existence of these kinds of questions illustrates the need for critically examining how, for and by whom, and in which circumstances technologies such as visualization are mobilized.

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