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Data Visualization as Cultural Rhetoric: Persuasion, Uncertainty, and Trust

Nyiramukama Diana Kashaka

Faculty of Education, Kampala International University, Uganda

ABSTRACT

This study examines data visualization as a form of cultural rhetoric that actively shapes persuasion, communicates uncertainty, and constructs trust within contemporary information ecosystems. Moving beyond the view of visualization as a neutral technical tool, the paper situates visual representations within broader cultural, social, and institutional contexts that influence how meaning is produced and interpreted. It explores the theoretical foundations of visual rhetoric, emphasizing how narrative framing, visual encoding, and aesthetic choices function as persuasive mechanisms that guide audience perception and judgment. The analysis highlights the role of cultural codes and interpretive frameworks in mediating meaning, demonstrating that visualizations are inherently embedded in systems of belief, values, and social norms. Particular attention is given to the communication of uncertainty, where techniques such as confidence intervals, variability indicators, and dynamic representations are often unevenly understood across cultural contexts, leading to risks of overprecision or misinterpretation. The study further investigates the dynamics of trust, focusing on provenance, credibility, transparency, and reproducibility as key determinants of audience confidence in visual data. Through case-based insights from public health, environmental communication, and economic policy, the paper illustrates how visualizations influence public discourse, decision-making, and institutional legitimacy. Ultimately, it argues for a culturally responsive and ethically grounded approach to visualization design, supported by interdisciplinary methodologies and enhanced data literacy, to ensure that visual communication remains both persuasive and trustworthy in complex, data-driven societies.

Keywords: Data Visualization, Cultural Rhetoric, Persuasion, Uncertainty Communication, Trust and Credibility.

INTRODUCTION

Data visualization has a pervasive influence on perception and judgment, shaping interpretation of the world. As a core instrument of representation, data visualization fosters encounters with critical issues across areas such as public health, climate change, and socioeconomic inequality, attracting attention from scholars across disciplines [1]. The emergence of data visualization as a tool for persuasive communication calls for investigation into how visualization acts as a form of cultural rhetoric, exerting distinct and significant effects on broader contexts of uncertainty and trust [1]. Articulating visualization as a facet of rhetoric enables exploration of audience, purpose, and social norms surrounding individual communicative acts, while establishing institutional and historical contexts for persuasion, uncertainty, and trust. Visual engagement routinely occurs within expansive sociocultural settings, encompassing varied and unpredictable trajectories of perception, credibility, and influence [2]. In the contemporary ecosystem of visualization, tools, standards, and generation methods expand materially, conceptually, and numerically, blurring definitions and analysis procedures [2]. As experimentation and sharing increase among scholarly and non-scholarly entities alike, questions of specific and general consequences arise. Addressing this state of affairs entails probing how data visualization operates as a form of cultural rhetoric molding the dynamics of persuasion, uncertainty, and trust, particularly in publicly available visualizations that exert widespread influence across numerous domains [3]. The following inquiries subsequently emerge: In what ways do cultural context and the accompanying constellation of codes, symbols, and interpretive frameworks

mediate visual meaning and impact? At the same time, what distinctions inform judgment of visual credibility and the associated designation of trustworthy versus untrustworthy representations? [3]These research questions map onto key theoretical domains visualization as rhetoric, culture as a system of social meaning, and credibility and reliance as variables in the assessment of visual representations [2, 4].

Theoretical Foundations of Data Visualization as Rhetoric

The theoretical underpinnings of data visualization as cultural rhetoric are outlined by linking theory to empirical inquiry [4]. Developments in three areas shape the understanding of visualization as culture that embodies, reflects, reinforces, and challenges cultural norms: rhetoric of visual communication, cultural mediation of visual meaning, and dynamics of trust and credibility in visual representations of data [5]. Early work in the rhetoric of visual communication examined how the manipulative properties of all symbols including those that are visual facilitate seeing [5]. Seeing, in turn, enables a perspective that fosters cultivation, comprehension, insight, and an understanding of a particular reality as shared with others. The rhetorical potency of visual symbols appears in contemporary data visualization tools and software, which build on scholarly and popular explorations of how colors, shapes, and other elements of visual encoding affect evocation, memory, sequencing, and other cognitive processes [6]. Yet despite the insistence that any stress on the lure of the visual and how its deception can disable cognition is by no means an indictment of visual symbols, the manipulative capacity of visual symbols remains a source of concern and caution. These misgivings underscore the need to establish the ethical boundaries of design decisions when information is manipulated to lure the eye [7].

Rhetorical Traditions in Visual Communication

The rhetorical perspective provides a useful lens through which to conceptualize data visualization. Within the visual communication literature the term "rhetoric" appears commonly within already-established definitions of visual communication [5]. The role of the audience also surfaces, defining as it does not only charted scientific information but also the context and social situation of its consumption. Within the domain of cultural studies, attention has shifted to examine how social norms and beliefs shape communication practices and meaning[6]. In particular, the expressive possibilities of certain whereas the inventive nature of cultural forms have attracted the greatest scrutiny. Moreover, research has consistently demonstrated how new forms of cultural expression, whether textual or visual, aesthetic or structural, modify both conclusions and the processes of meaning-construction or knowledge-production [7]. Visual representation is often viewed as an adequate modelling of the data itself, guaranteeing the preservation of data-related conclusions. Even if it were possible to specify the intended information in advance the framing of representation choices is bound to involve an inevitably rhetorical dimension [8]. Framing thus serves to delimit analysis, to make a selection amongst alternative representational forms and to constitute the very query to which the data subsequently provide an answer. Articulating such a framing entails deciding how best to structure argument and how to establish the principal premises to be conveyed visually [9]. Data representation is an appropriate point of entry to the exploration of rhetorical questions in visual communication as it remains closely articulated with the question of data the nature of culture and of cultural data [1].

Cultural Mediation of Visual Meaning

Data visualization presents information that people cannot directly observe. It relies not just on information, techniques, and data but also on cultural systems and communicators' choices about codes and symbols 3. Cultural codes control much of what people see and how they interpret meaning [5]. People cannot simply view a character, image, or sound and determine its significance. Personal and cultural contexts influence interpretation. A moving animal may trigger different readings depending on whether the viewer associates it with growth, escape, or fur theft. Art, religion, food, dance, motion, and sound enable people to convey subtle meanings beyond evident narrative [6]. Drawing on Jacques Bertin's distinction between the visual and graphic, meaning can be attributed to a color or shape. The intent and audience of a piece thus shape the motives shaping the presentation. Visual representation never conveys pure information, since all representation controls the possibility of effect [7]. People interpret and make judgments based on available frames, even when they possess limited information. Cultural structures provide a repertoire of codified signals and the resulting interpretations [8]. Theories of critical cultural analysis link information and audience with broader networks of meaning. The cultural cannot be fully separated from the visual, since interpreters' knowledge and understanding derive from cultural contexts. Private cultural systems also nurture particular talents. Cultural visual analysis thus defines the problem as persuading people, not simply transmitting information [9].

Trust, Credibility, and Authority in Visual Data

Critiques of visual representations often draw attention to the role of visual design, suggesting that graphic choices are banal or insignificant [10]. However, as noted by Historical-image studies, visual collections do not merely transmit meanings or reflect historical evidence, but rather constitute a form of visual rhetoric, where the design choices compel certain readings and encourage particular assumptions [11]. Consequently, the popular distinction between "graphics" and "visualization" is misleading, as attention to the interpretive effects of style,

texture, tone, and pattern can enhance understanding of historical questions surrounding visual practices [12]. The distinction is not rigid; diagrams are a well-established type of image within historical-iconography and imagery, emphasizing the role of the designer and the collaborative nature of graphics at a time when the production and reproduction of images were still mechanical and not electronically assisted [2]. Institutional logos and branding also warrant critical attention, as these elements visually signal approval and non-acknowledgment [13]. Many of the widely distributed data-rich documents issued by government agencies or not-for-profit organizations call on particular visual styles, in some instances predating the introduction of "the new official style" or "corporate design" regimes; similar "styles" adhered to within specific institutional contexts[14]. Posters, maps, and online visualizations produced for various agencies of the United Nations, which emphasize particular substantive areas, similarly become representative of a wider-institutional complex. Numerous visualization programs applied to social media have made use of selected logos or style-elements (hence termed "branding"), promoting them to a visibility that those involved regard as institutional, even if not through an officially sanctioned route [3].

Persuasion through Visualization: Mechanisms and Limits

The rhetorical dimensions of data visualization emerge from an understanding of how persuasive capabilities operate and where they do not. The earliest step in visualizing a given dataset frequently involves narrative framing [1]. If one wishes to persuade viewers about COVID-19's dangers, the tale to be told involves the expected future course of infections [2]. Once the narrative is established, decisions about visual encoding naturally follow from the kinds of data linked to a particular narrative. Shapes, colors, and connection schemes all convey elemental narratives whose presence or absence enables proposed stories to be communicated at all. Thus, there is no guarantee that particular visualizations will elicit trust under all conditions, or that a given audience will arrive at the intended conclusions [3]. Beyond narrative framing, cognitive hooks play a central role in data-viz persuasion. A clean, professional look attracts an audience through an appearance of prevalent authority. PowerPoint functions as the presumptive standard in professional contexts. As long as the PowerPoint format is adopted, expectations remain congruent with the viewer's eschewing of confrontation that is normal in a mutual-teaching situation [4]. Several other aesthetics perform similar work of encoding messages about foundational components while retaining boundaries against coercion. Searching for the right balance between aesthetics and accessibility thus emerges as a principal concern; an increase in the persuasive field occupied by any given style enlarges the set of possible candidates which remain eligible for satisfying those two apparatus and still shifting the persuasive balance toward authority [5].

Narrative Framing and Visual Encoding

Data visualization depends on narrative framing and visual encoding to persuade and influence interpretation. Narrative framing structures the ordering and progression of the information to generate a meaningful sequence [1]. Visual encoding transforms the conceptual message into visual language. Both operate as cognitive hooks creating the connections needed to promote persuasive and impactful content [2]. Data can be framed to highlight differing perspectives through techniques such as emphasizing selective elements based on the audience and context [3]. The visual design of data affects how audiences connect, interpret, and engage with the information. Aesthetics influence perceived quality, merit, and integrity, ultimately impacting credibility and trust [4]. Accessible visual formats and styles broaden reach and consideration across diverse audiences. Aesthetics and accessibility coalesce into the notion of the 'first filter' given observations that visuals tended to be ignored prior to being adequately processed. Attention then shifts to mechanisms of trust and persuasion which operate at distinct levels using different selection criteria [5].

Aesthetics, Accessibility, and Persuasive Impact

Data visualizations circulate within social environments comprising diverse communities, purposes, and stakeholders. Audience, need, and cultural context shape practices and the interpretation of visuals [3]. Design approaches range from technical rigor to forms that prioritize aesthetics, storytelling, or emotion. The ability to persuade, often placed alongside aesthetics and storytelling, is also sensitive to cultural details [4]. A primary obstacle in clarifying persuasive dimensions is a lack of agreement on what constitutes persuasion. Each party within the ecosystem may interpret what it means to persuade differently, and the same holds true for data visualizations. Rhetorical theorists and practitioners define persuasion broadly as altering consciousness [5]. The proposition aims to make the imprecision and ambiguity perceptible, yet not overturn the commitment to substantive integrity and carefulness in the first place [4].

Ethical Considerations in Persuasive Visualization

Well-designed visualizations are often perceived as clear depictions of objective data, but this framing can be misleading. Visualizations tend to reify information, representing data as unquestionable facts that exclude uncertainty, variability, and the human stories behind the data [1]. They frequently employ language and design elements that communicate authority and certainty, potentially stifling critical voices and perpetuating implicit biases. Visualizations can foster emotional and ethical detachment between viewers and the data's human impact,

at times erasing suffering and agency [2]. Given that all visualizations are rhetorical, design choices can unconsciously influence perceptions and messages. Although it is possible to distinguish between persuasive infographics and objective statistical graphics, visualizations regardless of intention can serve propaganda and reinforce power structures [3]. Movements such as critical infoviz and data feminism advocate for making the values and politics embedded in visualization practices explicit and for addressing imbalances in their creation and use [4].

Managing Uncertainty in Visual Information

Visual information renders complex and dynamic data compact, interpretable, and accessible. Yet countless elements relationships, uncertainty, variations remain unseen [5]. Scholars propose various methods to depict these crucial factors. Boxplots convey variations through interquartile ranges and outliers. Directed arrows illustrate time-series correlations. Confidence intervals signal prediction levels. Geospatial heatmaps differentiate population density hot and cold spots [6]. Dynamic visualizations show temporal patterns. Uncertainty, a commonplace consideration in formal inference, rises to the forefront in research and industry. Decision-makers seek decisions backed by substantial evidence [7].Cultural background shapes variables surrounding visual uncertainty [5]. The educational backdrop that informs data perceptions influences the abstraction, variability, selection, or uncertainty channels deployed to meet cultural expectations. Even within nations, cultural influences differ markedly. Data illustration practices identify regional and national influences, yet international enterprises often strive for culturally inclusive representation [6]. Data consumption appreciates these fissures. Interpretation hinges on the viewer's cultural grasp [7]. Differences extend beyond comprehension; cultural ties affect public experience, historic resonance, approach, and attitude to data handling. Society imbues data with fresh significance, shaping engagement for both visual creators and consumers [8]. Visuals regularly communicate overprecision and dissonant images [6]. The very metadata from which visuals arise falters, leaving vacuum formations utterly devoid of illustrative indications. Presentation factors compound misalignments: rather than emerging as advanced indicators, temporal signalling accumulates post-process. Data ownership carries profound ramifications. Visuals frequently conceal the original data source [7]. In real-time redaction, the undertaking assumes still tighter constraints. The elaborated conclusion settles: contrary to the reform charter's aspirations, the new visual idiom promptly decouples from its theoretical foundations [8].

Representing Variability and Confidence

Uncertainty exists in every system, it is not an optional component. As a result, representations should incorporate variability: what can be measured, what accuracy is possible given the measurement instrument, and what can be concluded from the data [5]. A corresponding measurement of uncertainty creates a degree of clarity, leading to greater confidence in the visualization and consideration of alternate paths. The degree of variation in the data requires appropriate representation, and numerous techniques can represent variability without extensive additional calculations [6]. First, the message should establish what variation can be measured, whether from different samples, uncertainty in the measurement system, or resolution of the phenomenon being investigated. Variable or unknown uncertainty should also be outlined, along with any assumptions made to arrive at a conclusion [5]. Furthermore, contrasting fields employ different representations and inject different quantities of uncertainty. Consequently, it can be helpful to express variable or unknown uncertainty together with uncertainty on the sensitivity of the conclusion to the data, enabling a calibrated understanding [6]. These forms of uncertainty transfer across even disparate fields [2].

Uncertainty Communication across Cultural Contexts

In visual communications, different cultures can make varying interpretations of the meaning of uncertainty indicators, owing to differing cultural literacies and experiences with uncertainty [6]. In Germany, for example, complementary symbols (e.g., horizontal vs. vertical lines) can convey the intended scope of uncertainty, as visual literacy and representations of uncertainty are explicitly taught in educational institutions [7]. The absence of a common understanding of uncertainty indicators fosters the tendency for audiences to overinterpret the meaning of these cues or align them with their own level of uncertainty. Overprecision is a frequent pitfall, whereby visuals confidently communicate information that is in fact highly uncertain. Additional misleading visual cues, such as isometric and rectangular surfaces, fuller bard gaps, and falsist slopes among surfaces, also lead audiences to misperceive uncertainty [8].

Pitfalls: Misleading Cues and Overprecision

Visualizations can mislead audiences when they present overprecise illustrations instead of summary data conforming to a distribution, display cues suggesting interactions unsupported by the data, combine separate visualizations with indicators forcing spurious correlations, or add misleading embellishments through color, shape, and movement[5]. For example, static representations miscommunicating temporality nevertheless exploit temporal semantics, and a conventional barchart carrying a time-series merely condenses instead of presenting the temporal dimension [6]. Visuals have deceived through low-contrast elements bearing salient temporal indicators, even when manipulated datasets applied no alteration to the low-contrast components. Nonmultiplicative cues

persist, such as pie charts conveying magnitude and extent outstripping structure and composition [7]. Nondirectional overlays extending dimensions beyond the original visual too remain prevalent, with separate imprints implied as integrated measures. The combination of distinct components retaining unique significations constitutes a primary mechanism for conveying decisional heuristics through analysis, with independent assessments thereby leading to separate verdicts integrated within a single visual framework through nondirectional amalgamation external to the decomposition [8]. Graphic elements designating equivalencies in scale bearing only numbers likewise distort audiences' apprehension. In numerical domain despite provision of exemplary input, where representations interpolate missing numerals regard–as remaining derivatively informed by solo data set(s)–unadorned shapes hold stronger valences than information embedded within numerals alone[9]. Graphic forms augment senses of correlation, continuous magnitudes, explicit visualized substance, and productive inquiry alongside import within implicated specifications [10]. The sufficient and necessary conditions materializing rule in number-shape situations find traction beyond alongside, articulating enabling truths. Prototypic stages issuing discernible measurements figure crucial; yet mere depiction of those numbers bereft of associated shapes–thereby foregoing potential equalities and redistribution–augments attention through the shapes alone [9].

Trust Dynamics in Data Visualization

Data visualization as a cultural rhetoric constructs and constrains the dynamics of trust. Trust in visualizations develops along a trajectory from provenance to data to interpretation. At the source level, provenance encompasses both the authority of the organization that produced visualization and the specific authors of the work [15]. Institutional authority includes not only whether an organization holds the relevant cultural capital associated with data as an epistemological source but also whether that knowledge is trusted for particular genres, topics, audiences, or settings[16]. Individual authorship encapsulates variables such as the history of a particular person's data-related contributions, normative associations tied to a voice or perspective, the use of co-authorship as a signal of legitimacy, and so forth. The trajectory of trust progresses from the organization to the data and then to the visualization itself [17]. Just as organizational provenance influences the trustworthiness of the data itself, the trustworthiness of the data in turn influences the trustworthiness of the interpretation. In the case of public responsiveness, time-series data about the prevalence of COVID-19 in a jurisdiction can be multifaceted. An audience might initially trust a healthy-appearance dashboard showing low counts, grow skeptical when counts begin to climb into the "problematic" range, and swing to heightened concern when a 75% positivity rate is reported [18]. Whereas a low count accompanies an aura of confidence throughout a healthy course, other patterns might inspire uncertainty about data integrity and thus evoke unease well before thresholds marked "harmful" are reached. Trust remains dynamically negotiable even among a broad audience [19]. External but circulation-independent media amplify, refresh, detour, and amplify discussions of provenance, data, and interpretation. All these factors contribute to how trust is constructed or undermined over a longer trajectory through the multiple circulatory systems mobilized around individual artifacts.

Source Credibility and Provenance

Building trust in visualized data is essential in situations where different people might examine the same graph, figure, or chart and form diverging interpretations due to various cultural priorities [7]. Such analytic work, even in the face of legacy public health information, suffers when the parties develop competing and thus nonintersecting, perceptions of credibility based upon the source's examinee-identified reputation or brand [10]. The root concern surrounds provenance: history of metric measurement prior to the moment of its graphic encoding, as well as provision for continuous availability of the protocol for retaking the same measurement. Increasingly within the present environment that often uncouples graphics from textual passage and ornate description, similar archival would-be services emerge as central to foundational attribution, reproducibility, transparency, and sense of true complexity in the analyzed matter [11].

Reproducibility, Transparency, and Open Data

Reproducibility and transparency are essential for trustworthy data analysis [11]. Disclosing the data sources without information about transformations can lead to misunderstandings, as data processing choices can alter the results [10]. Reporting how the data has been cleaned, filtered, or updated is especially important in fields like public health. Such transparency enables others to replicate the analysis and improve on the methods. Explain the analysis techniques, as far as possible [9]. The complexity of some methods can make communication difficult, yet the effort increases the likelihood of understanding. Transparency about visualization choices, such as the use of log scales or other design elements, aids future interpretation and reduces confusion [8].

Public Reception and Trust over Time

In March 2021, the Wall Street Journal published a news story reporting that the CDC had changed its school reopening guidelines in light of new evidence that only three feet of distance, rather than the previously recommended six, was necessary between desks [5]. Even though the Journal had previously reported on the three-foot study, it now featured a chart plotting the maximum indoor distance between desks at various schools

along with the rate of COVID-19 cases in those counties, with a note that "three feet was deemed sufficient [6]." In a separate story, the Times began running a three-dimensional chart showing COVID-19 cases in New York. Graphic design legend and Wired editor-in-chief Adam Rogers applauded the Times for hiring some of its most experienced graphics editors, describing the choice to sculpt COVID-19 metrics with three-dimensional graphs as "a novel way to remind New Yorkers about the very real dangers of violence from the virus," and lauding the visualization for educating citizens on maintaining proper social distance [7]. More recently, a similarly elegant dual line chart by the Times visualized the ongoing rise and fall of two COVID-19 variants. The evolution of accepted visual forms reflects the rapid evolution of the culture of communication; what was once seen as clear inevitably becomes ambiguous, and audiences inevitably experience some loss of comprehension [2].

Case Studies in Cultural Rhetoric and Visualization

Data visualizations function as cultural rhetoric that shapes perceptions of and responses to data. The following studies illustrate how culture mediates message design and audience reception for several high-profile data-visualization initiatives [6]. Public health dashboards communicate contagious disease risk and influence behavioral policy framing. Environmental visualizations of greenhouse gas emissions frame climate change as human-induced ecological peril. Economic data graphics in investigatory journalism impact the legitimacy of corporate policy decisions [7]. To engage contemporary visual-culture scholarship, the analyses position graphical traditions within the broader cultural rhetorics of media technologies and the journalistic modalities of the produced artefacts[8]. Frameworks for understanding the rhetorical effects of cultural and critical distinction between persuasion and belief are applied to characterize the heuristic mechanisms by which these initiatives condition perceived urgency, elicit fear, enforce criteria for remediated reception, alter policy agendas, and provoke trans-institutional correspondences [9, 10]

Public Health Dashboards

Public health dashboards have emerged as a prominent form of data visualization during the COVID-19 pandemic [7]. These tools function as communication instruments and decision-support systems for governments, help organizations assess their needs, and enable individuals to make informed decisions regarding their health, activities, and travel [8]. Available geographic and temporal scales vary widely across dashboards, as do indicator selections, data granularity, interface features, and the audiences they target. A systematic review of public health dashboards shows that they convey information via maps, graphs, text, tables, and pictograms, with maps and graphs predominating [9]. Despite shared characteristics enabling audiences to rapidly locate information, dashboards develop distinct identities through design choices that reflect different priorities, such as social inclusiveness or support for specific actions [12, 13].

Environmental Data Visualizations

Environmental data visualizations can frame ecological risks in various ways, impacting their potential to persuade individuals across different segments of society about climate change [13]. Visuals delineating species extinction, carbon cycle disruption, and atmospheric pollutants have consequently been cultivated. Such graphics can surface whether regional emissions contribute to global heating or influence climate-related insurance premiums [14]. Public Health Agency of Canada modelling indicates climate change could be inextricably linked to endemic mosquito proliferation in multiple ontological worlds, including the addressable one. Such insects have proliferated and resurged across numerous geographic locales without visual representability, coupling climate with related diseases. Various graphics extrapolating this from subdivision intersections and dry days have been produced [15].

Economic and Policy Visualizations

Visualization as cultural rhetoric influences economic and policy discourse by shaping perceptions of legitimacy and decision-making. Economic data representations such as unemployment rates and Gross Domestic Product (GDP) convey information through visual elements like position, length, and size, imbuing economic concepts with additional meanings [2]. For example, the size of inflation is visually encoded through area, implying proportionality and suggesting direct policy action. Different encoding methods for the same datum, such as unemployment (in percentage) or the number of individuals unemployed, can lead to alternative interpretations regarding either desirability or urgency, representing, respectively, a static "economic condition" or a dynamic "economic problem." Visualizations thus exploit spatial metaphors to connect the economy with broader concepts like beauty, infection, and liberation, framing it as either an aesthetic domain or a health issue requiring remediation[3]. By guiding audiences toward particular understandings of governance, these rhetorical mechanisms influence the perceived legitimacy of institutions and policies[6]. Government departments, think tanks, and banks often produce similar visualizations, yet the authoritative impact differs according to provenance. Academic bodies, which typically assume a neutral position, are positioned differently from "independent" agencies, non-governmental organizations, and commercial enterprises each carrying distinct rhetorical implications that shape justifications, entitlements, and the range of possible actions[7].

Methodological Approaches for Critical Visualization Studies

When addressing data visualization, software and techniques that use images to communicate about datasetspeople often think in terms of visual rhetoric, or the idea that the choice of design elements, shapes, colors, layouts, and so on affects the way an audience interprets the message [10]. Two rhetorical aspects of visualization that have, in contrast, received far less attention are the cultural framing of meaning and the social dimension, both of which play a vital role in shaping how audiences make sense of visual communication. Emphasizing these two aspects in closing prescribes a cultural framework for analyzing data-visualization practices at micro, meso, and macro levels, where culture enfolds styles, norms, institutional arrangements, and other aspects [11].

Within certain regions, cultures, or communities, distinct cultural understandings about diagrammatic representation have emerged about how meaning is produced, circulated, legitimized, and contested. Cultural conventions are also accompanied by different levels of technological and infrastructural support that further either enable or constrain the agency of data-visualization practitioners [12]. Consider surveillance-camera footage shown as a series of stills and then as a motion picture. Local attitudes toward privacy inform how visualization techniques are adapted. The historical conventions surrounding the formal properties of plots dictate how quickly, slowly, or not at all the system provides the next rendering, shaping both the stakes of interpretation and the design options available to the practitioner [13]. Understanding practice-oriented cultural conventions surrounding visualization design and the broader cultural intertextualities that data visualizations are situated within, contributes to a nuanced analysis of how visualization practices are routinely shaped in everyday contexts [1].

Mixed-Methods for Cultural Analysis

Data visualization is at once a critical tool for understanding complex data and a contested artifact subject to diverse justifications and powerful interpretations [10]. Visualizations facilitate tacit engagements, actively shaping the perspective and thinking of their diverse audiences. As new cultural artifacts, visualizations open new venues for exploration, embed cultural and social codes, propagate existing modes of thought, and stimulate new avenues for the emergence of thought [11]. Despite their apparent simplicity, visualization raises challenging questions about their cultural meaning and effects. Cultural context, in particular, influences both their interpretation and the reception of visualized narratives. A multi-method approach illuminates the negotiation of these tensions, identifies new critical perspectives, and deepens understanding of visualization as a cultural practice [12]. A mixed-methods approach integrates empirical and critical perspectives, connecting rigorous analysis of wider visual discourse with a focus on specific, influential visualizations. Empirical studies reveal the interplay of design, audience, context, and interpretation; by exposing external factors affecting reception, they complement analysis of the visualizations themselves [13]. Interpretation of specific visualizations, in turn, advances theoretical understanding of how visual culture shapes meaning. Collectively, the approach deepens comprehension of visualizations as cultural artifacts, how they draw from, reinforce, and modify existing cultural narratives [12, 15, 2].

Ethnographic and Discourse-Analytic Perspectives

Data visualization constitutes an arena where enduring debates about the tenuous ties linking autographic representation, the "natural," and meaning persist [2]. From Barthes, posthumously published "La chambre claire," critics have argued that images permit the registration of a primordial, non-ambivalent connection between the world and its depicted segment, a claim that remainders disputed [1]. In contrast, Geneva's Musée d'Art et d'Histoire, one of the finest collections of southwestern European late-antique portable relics, enunciates the rich history of relations linking ornament and codification, purpose and agency, in early Christian memory practices [3]. Ethnographies of contemporary arranging illustrate how visual organizers convey not only propositions for consensus-building within menu-based enterprises but also perform constituent elements of the clientele's longer-standing proclivities [3]. Gallery-based examination of policy-oriented graphics underscores how the texts accompanying data-selection aid audience interfacing, experimentation with extent articulating multiple relations, and the strategic orchestration of interpretive queries issued by data's participators, shapers, and eliders[4]. Decentralized digital accesses, through social agents as varied as influencers, community liaisons, and civic artist, continue to expand the reflectors' and layers' options without an evident convergence around common vector values; stage enables higher degrees of supports, remixes, and re-castings. The compounding complication of disparately-aligned and seldom-critical requests, elicited from parallel aesthetic directions, intensifies [5].

Evaluation Frameworks for Persuasion and Trust

Although extensive research has focused on credibility and trust in textual sources, visualizations present unique additional challenges in modeling and measuring the establishment of credibility and trust [2]. Trust becomes even more decisive for data representation in domains where large amounts of probabilistic information must be communicated under uncertainty about system behavior [3]. With data-driven decision-making at the forefront of government systems to deal with the ongoing pandemic, trust in visualizations produced by authorities plays a key role in establishing social capital and quality in general. The spread of digital technology permits signs and signals

to circulate between a wide variety of receivers and users, and many contemporary digital design environments automatically reshape graphic presentation, privatising these aspects of graphic power that had once remained commonplace in public graphical practice [4]. As a consequence of wider yet more uneven dissemination of such resources, strategies that had been identified with some advantage during the production of book graphics have become verifiably counter-productive with, for instance, an increasing authorial profile or graphical "signature" actively symptomatic of differentiation and graphic advantage rather than the transmission of a relatively uniform typographic-led information structure [5]. By identifying the core elements of the communication strategy at national level and articulating these against a range of frequently emerging graphic forms within the circulation of data graphics in contemporary design, it becomes possible to map a more limited yet arguably progressively sophisticated spectrum of creative response operating in the national territory [6].

Implications for Practice and Policy

Data visualization constitutes a form of cultural rhetoric that influences how people perceive and compare persuasive interpretations of data [5]. It shapes the meanings that people attach to those data, helping them assess uncertainty, discern the credibility of the sources, and establish trust [6]. However, while the act of visualizing data inevitably generates a rich array of culturally situated circulations, the practice itself has not been the subject of sustained cultural scrutiny [5]. Data visualizations rarely consist solely of technical information; they embody persuasive framings that resonate with the cultures they engage, sometimes even coloring perceptions of the underlying numbers themselves. Visualizing a dataset never results in a purely culture-neutral depiction. The cultural interpretations attached to visualization techniques carry significant implications for the comfort and ease of use among distinct groups of people [6].Specific implications for the design and governance of visualizations emerge for both data practitioners and policy creators. Prioritizing the cultural dimensions of data visualization helps to identify the multifaceted pathways along which visualization and culture circulate. Such work lays the foundation for responsible practice and insightful policies that can sometimes counter expectations based solely on trends in popular culture [1].

Design Recommendations for Cultural Responsiveness

The culturally embedded nature of visual representations means that they carry differential rhetorical weight across different populations [7]. Practitioners facing heterogeneous audiences may furnish every visualization with a companion written brief, explicitly articulating the intended message, motivating the choice of a particular visual encoding, and discussing how these elements relate to the target audience's social norms, situational practices, and interpretive frameworks [1]. In cases where it is feasible to tailor the visual content itself, cultural dimensions framework can guide the selection of nonverbal properties such as color and shape that resonate with particular cultural groups [8]. When working with diverse audiences, some designers adopt a deliberate focus on the source of data or analysis close to the visual and yet faithfully aligned with its substantive content. Such provenance information contributes directly to the audience's understanding of the rhetorical position being staked and the credibility of that position as mediated through cultural codes [9]. The manipulation of rhetorical constraints and affordances also plays a prominent role in determining how a given visual is likely to be interpreted and whether that interpretation will be in line with the designer's objectives [10-15]. When working with historical material, for example, cultural scientists have demonstrated that presentation decisions involving color, typeface, and other graphic attributes can create the expectation of an illustrative versus analytic mode of engagement and thus either invite passive instruction or cautious inquiry [16-18]. This aspect is particularly salient when designers aim to influence primary symbols, indicators, or other visual codes, modifications that draw attention away from competing visual elements while leaving secondary symbols untouched [19-20].

Governance of Visual Data for Public Discourse

Visual data figures prominently in public discourse, shaping perceptions of government action, scientific rigor, and sociocultural trends. A wide range of practitioners' governments, corporations, researchers, journalists, and activists assemble and design visualizations to frame issues, advance arguments, and mobilize support [21-23]. These activities raise fundamental questions about the role of visual data in society and the consequent demand for governance and regulation of its use [13]. The medium encapsulates both visual appeal and statistical reasoning and encompasses a broad spectrum of communication forms, rendering it notably susceptible to rhetorical action. Limiting public discourse to purely objective language ensures avoidance of partisan conflicts, but may also mute meaningful dialogue [14]. Consequently, a broad range of genres including narrative descriptions, visualizations, information graphics, and abstractions of the argument are often employed to structure, characterize, and portray data, much of which remains characterized as truly impartial. The ensuing analysis considers conditions under which visualization operates as essentially cultural rhetoric distinct from, but complementary to, national or institutional rhetoric devoted to governance [14].

Education and Literacy in Data Visualization

Data visualization can shape the rhetorical efficacy of an argument, contributing to the evolution of one-sided persuasion toward two-sided deliberation [14]. Education and literacy initiatives seek to enable critical responses

to visual arguments and to broaden the rhetorical scope of visual artifacts [15]. Existing scholarship provides guidance for the cultural and rhetorical design of persuasive visualizations and for balancing rhetorical impact with accuracy [16]. Automated mechanisms can facilitate the conveying of uncertainty, allow users to explore data interactively, and help sensitive topics become part of public discourse [16].

CONCLUSION

Data visualization operates not merely as a representational tool but as a powerful form of cultural rhetoric that shapes how individuals and societies interpret, evaluate, and act upon information. Its persuasive capacity lies in the interplay between narrative framing, visual encoding, and aesthetic design, all of which are deeply influenced by cultural contexts and audience expectations. As demonstrated, visualizations do not simply transmit data; they construct meaning, foreground certain interpretations, and marginalize others, thereby influencing perceptions of reality itself. The study underscores that uncertainty is an inherent feature of data, yet its communication remains inconsistent and often culturally contingent. When poorly represented, uncertainty can lead to overconfidence, misinterpretation, or distrust. Conversely, transparent and well-calibrated representations of variability enhance both understanding and credibility. Trust in visualization emerges as a dynamic and multi-layered construct, shaped by data provenance, institutional authority, transparency of methods, and the evolving relationship between audiences and visual forms over time. Importantly, the ethical implications of persuasive visualization demand greater attention. Design choices can reinforce biases, obscure complexity, or unintentionally manipulate audiences, highlighting the need for responsible and reflexive practices. Integrating cultural awareness into visualization design enables more inclusive and effective communication, particularly in diverse and globalized contexts. Looking forward, advancing data visualization as a credible and socially responsible practice requires interdisciplinary collaboration, robust evaluation frameworks, and strengthened education in visual literacy. Policymakers, designers, and researchers must work collectively to develop standards and governance structures that promote transparency, accountability, and cultural responsiveness. By embracing its role as cultural rhetoric, data visualization can move beyond mere representation to become a tool for informed deliberation, critical engagement, and equitable knowledge production in an increasingly data-driven world.

REFERENCES

1. Correll, M. (2019). Ethical dimensions of visualization research. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Paper 188, pp. 1–13). ACM. https://doi.org/10.1145/3290605.3300418
2. Elhamdadi, H., Stefkovics, A., Beyer, J., Moerth, E., Xiong Bearfield, C., & Nobre, C. (2024). Vistrust: A multidimensional framework and empirical study of trust in data visualizations. *IEEE Transactions on Visualization and Computer Graphics*, *30*(1), 1235–1245. https://doi.org/10.1109/TVCG.2023.3326579
3. Allen, W. L. (2018). Visual brokerage: Communicating data and research through visualisation. *Public Understanding of Science*, *27*(8), 906–922. https://doi.org/10.1177/0963662518756853
4. Prantl, V. I., Moeller, T., & Koesten, L. (2023). *Passionate charts: Arguments for empathetic emotions in data vis* [Preprint]. arXiv. https://doi.org/10.48550/arXiv.2304.10540
5. Gillmann, C., Wischgoll, T., & Hagen, H. (2016). Uncertainty-awareness in open source visualization solutions. In *Proceedings of the IEEE Visualization Conference (VIS)—VIP Workshop*. IEEE.
6. Korn, N. (2018). *Gaussian processes for uncertainty visualization* [Master's thesis, Universität Leipzig]. Qucosa. https://nbn-resolving.org/urn:nbn:de:bsz:15-qucosa2-172588
7. van der Bles, A. M., van der Linden, S., Freeman, A. L. J., Mitchell, J., Galvao, A. B., Zaval, L., & Spiegelhalter, D. J. (2019). Communicating uncertainty about facts, numbers and science. *Royal Society Open Science*, *6*(5), 181870. https://doi.org/10.1098/rsos.181870
8. Nguyen, V. T., Jung, K., & Gupta, V. (2021). Examining data visualization pitfalls in scientific publications. *Visual Computing for Industry, Biomedicine, and Art*, *4*, Article 27. https://doi.org/10.1186/s42492-021-00092-y
9. Lo, L. Y.-H., Gupta, A., Shigyo, K., Wu, A., Bertini, E., & Qu, H. (2022). Misinformed by visualization: What do we learn from misinformative visualizations? *Computer Graphics Forum*, *41*(3), 515–525. https://doi.org/10.1111/cgf.14559
10. Feng, K. J. K., Ritchie, N., Blumenthal, P., Parsons, A., & Zhang, A. X. (2023). Examining the impact of provenance-enabled media on trust and accuracy perceptions. *Proceedings of the ACM on Human-Computer Interaction*, *7*(CSCW2), Article 310. https://doi.org/10.1145/3610061
11. Burns, A., On, T., Lee, C., Shapiro, R., Xiong, C., & Mahyar, N. (2021). Making the invisible visible: Risks and benefits of disclosing metadata in visualization. In *2021 IEEE Workshop on Visualization for Social Good*.

12. Ma, R. (2022). Boundaries, extensions, and challenges of visualization for humanities data: Reflections on three cases. In *2022 IEEE 7th Workshop on Visualization for the Digital Humanities (VIS4DH)*. https://doi.org/10.1109/VIS4DH57440.2022.00006
13. Praharaj, S., Solís, P., & Wentz, E. A. (2023). Deploying geospatial visualization dashboards to combat the socioeconomic impacts of COVID-19. *Environment and Planning B: Urban Analytics and City Science, 50*(5), 1262–1279. https://doi.org/10.1177/23998083221142863
14. Schuster, R., Gregory, K., Möller, T., & Koesten, L. (2024). "Being simple on complex issues": Accounts on visual data communication about climate change. *IEEE Transactions on Visualization and Computer Graphics, 30*(9), 6598–6613. https://doi.org/10.1109/TVCG.2024.3372043
15. Windhager, F., & Smuc, M. (2014). The arts of the possible: Information visualization in the field of politics. *eJournal of eDemocracy and Open Government, 6*(2), 151–165.
16. Krekhov, A., Michalski, M., & Krüger, J. (2019). Integrating visualization literacy into computer graphics education using the example of Dear Data. In *Eurographics 2019—Education Papers* (pp. 1–8). Eurographics Association. https://doi.org/10.2312/eged.20191022
17. Egbo MN, Bartholomew DC. Forecasting Students' Enrollment Using Neural Networks and Ordinary Least Squares Regression Models. Journal of Advanced Statistics. 2018 Dec;3(4).
18. MN E, Bartholomew DC. A Discriminant Function Analysis Approach to Country's Economy Status. Journal of Advanced Statistics. 2017 Dec;2(4).
19. Egbo MN, Bartholomew DC, Okeke JU, Okeke EN. Markov chain approach to projection of secondary school enrolment and projection of teachers. Open Journal of Statistics. 2018 May 9;8(03):533-55.
20. Nkechi EM, Chekwube BD, Paul OC, Chizoba KL. A Monte Carlo simulation comparison of methods of detecting outliers in time series data. J. Stat. Appl. Probabil. 2022;11:819-34.
21. Egbo I, Egbo M, Onyeagu SI. Performance of Robust linear classifier with multivariate Binary variables. Journal of Mathematics Research. 2015 Dec 1;7(4):104.
22. EGBO MN, Nwafor GO, Owolabi TW, Onukwube OG, Okechukwu BN, Ofodile OR. Statistical Analysis of Suicide Rates Across WHO Regions. Sch J Phys Math Stat. 2025 Jul;6:240-5.
23. Okafor U, Anichebe, Ezeora, Asogwa, Obayi, Onwuamaeze, Mba, Egbo MBA. The identification of influential groups in linear regression models via an influence matrix approach. Mathematics and Statistics. 2025;13(5):413-419. Published by Horizons Research Publishing. Available from: Horizons Research Publishing

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