

An experiential account of a large-scale interdisciplinary data analysis of public engagement¹

Julian “Iñaki” Goñi, Claudio Fuentes & María Paz Raveau²

Abstract

This article presents our experience as a multidisciplinary team systematizing and analyzing the transcripts from the largest yet (1.775 conversations) series of conversations about Chile’s future. This project called “Tenemos Que Hablar de Chile” [We have to talk about Chile] gathered more than 8000 people from all municipalities, achieving gender, age, and educational parity. In this sense, this article takes an experiential approach to describe how certain interdisciplinary methodological decisions were made. We sought to apply analytical variables derived from social science theories and operationalize them through modern linguistics to guide a more theoretically-informed natural language processing. The analysis was divided into three stages: (1) a descriptive analysis adapting descriptions of computational grounded theory, (2) a futurization analysis operationalizing concepts from futures studies, and (3) an argumentative analysis operationalizing concepts from argumentation theory. Overall, our methodological experimentation shed light on potential learnings for integrating a multidisciplinary perspective on NLP analysis with sensitive social content. Firstly, we developed a strategy for translation of knowledge based on the construction of what we called “analytical categories” in which a normative expectation or descriptive dimension was identified in the body of literature, operationalized through linguistics, and programmed in Python or R. Ultimately, we seek to reflect on the importance of interdisciplinarity not only as means to find new analysis ideas but rather, to incorporate the critical, political and epistemological points of view to understand analysis as complex socio-technical processes.

Keywords: Natural Language Processing; Deliberation; Public Dialogue; Interdisciplinary research

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Introduction

The social and academic discourse around the complex relationship between technology and democracy has mostly been based on the tension between experts, policy-makers, and citizens (Carozza, 2015). In a complex modern society, institutions seeking to make socio-technically informed decisions is not clear how to determine what voices should be heard, under which circumstances, and to what extent? Should experts in particular domains occupy a privileged position, or would that be a sign of epistemic reductionism, political disenfranchisement, and blurring of the political and ethical elements of technically complex challenges (see Jasanoff, 2016)?

This relationship between experts and citizens has shown to be a relevant field of research as it opens up questions about authority, power, and political activity through and within science and technology (Brown, 2015). However, current approaches have also sought to overcome an often perceived dichotomic choice between expertise and democracy. This, in favor of aspiring at both a “democratization of science” and an “expertization of democracy” (Bader, 2014). The latter objective would require extensively examining and expanding assumptions of what a valid perspective is and opening up to a multi-source knowledge approach (Krick, 2018), especially considering the wicked nature of problems that science in society embroils (Daviter, 2019).

The democratization of Science and Technology has taken many shapes, including citizen science (Strasser et al., 2019) and responsible innovation (Robinson et al., 2020). However, ideals of public engagement are still the most frequent concept used for this purpose (Chilvers & Kearnes, 2020). Since the 1990s, Science, Technology, and Society (STS) scholars have extensively debated the why's and how's of public engagement, greatly influenced by the deliberative turn in democratic theory (Davies, 2019). However, public engagement as a political ideal for Science and Technology faces significant challenges despite its apparent benefits. In practice, “public engagement” most often operates as a buzzword that ultimately fails to close the gap between science and technology because of vague uses of “engagement” and “public” (Weingart et al., 2021). On the other hand, deliberative exercises in S&T often lack the scale necessary to produce systemic political change (Löfbrand et al., 2011) and often still operate with residual realists’ assumptions in which “the public” is not seen as an epistemic peer (Chilvers & Kearnes, 2020).

The “technification” of democracy has also seen relevant attention. These recent years have seen a rise of a “digital democracy” in which digital technologies are seen as a promise to improve democratic institutions worldwide (Noveck, 2017). In a digital democracy, technology creates tools to review laws, evaluate candidates and policies, and sustain citizen deliberation, improving government and citizens' feedback (Gastil & Richards, 2017). According to its proponents, data-driven technologies such as AI, IoT, Big Data, behavioral/predictive analytics, and blockchain are set to revolutionize government for the new era (Engin & Treleaven, 2019). Recent examples have shown the potential of Natural Language Processing (NLP) and Machine Learning to improve public participation through

aiding citizens in tasks such as feeding them meaningfully customized political information, improving citizen interactions in digital platforms, and aggregating/interpreting resulting data (Procter et al., 2021).

However, the digitalization of participation faces many unresolved challenges. There is an increasing amount of pressure to introduce more fairness, accountability, and transparency into automated analysis and development of data-driven solutions (Greene et al., 2019). For instance, demands for Explainable AI (XAI) seek to open up the black box of algorithms so stakeholders may understand how data decisions are made (Barredo Arrieta et al., 2020). In the context of public engagement, this is particularly relevant as data systematization and analysis processes may lead to misuses by political actors (Lago et al., 2019). More importantly, in a subject so sensitive as democracy, maintaining a critical stance in innovation discourse is key in order to avoid the fallacies of technocracy, technological determinism, and the language of unforeseeable unintended consequences of technology (Jasanoff, 2016).

To address these issues, interdisciplinary approaches combining the humanities, social sciences, and data science may be suitable for incorporating this problem's ethical and societal complexities (Patel et al., 2019). Interdisciplinarity in data science can entail conflict, as the different epistemic and theoretical backgrounds clash (Campagnolo, 2020), especially when incorporating critical perspectives from STS (Moats & Seaver, 2019). There is a need to understand further how interdisciplinarity operates in situated contexts to better assess its value as a driver for technology in democracy.

Moreover, there is a need to have more in-depth and holistic accounts of what interdisciplinary social data analysis is conducted in practice. In this article, we explore our experience as an interdisciplinary team analyzing and processing the data from the largest yet public engagement initiative in Chile. Through our experience, we seek to shed light on the tensions and potentials of interdisciplinarity and how our methodological approach served a critical role in articulating our different epistemic expertise. Additionally, we seek to theorize and reflect on the broader social and technical processes embedded in publicly orchestrated civic engagement initiatives. This, in consideration of how different moments of an initiative impact the analysis process and how final results produce political impact once they have been diffused into public media. Ultimately, we aim to address the question: How does the interdisciplinary collaboration process in social data science really happen, and how does it relate to the political interpretation of its end results?

Research context: Tenemos Que Hablar de Chile [*We have to talk about Chile*]

After massive political unrest and civil disobedience that started in October 2019, the two most traditional universities of Chile organized the biggest yet series of digital conversations about the country's future. This project called "Tenemos Que Hablar de Chile" [*We have to talk about Chile*] gathered more than 8800 people from all municipalities, achieving gender, age, income, and educational parity as well as substantive indigenous (22%) and rural (12%)

participation (Tenemos Que Hablar de Chile, 2021). More than 3500 hours of conversations were produced (Tenemos Que Hablar de Chile, 2021).

“Tenemos que Hablar de Chile” (TQH) sought to address citizen's demand for greater, more inclusive, and transparent spaces of democratic dialogue in which to produce a more legitimate vision for Chile's future. In particular, the project's objectives (Tenemos Que Hablar de Chile, 2021) were:

- To push for massive social dialogue about the country's challenges
- To promote a way of talking that values differences and allows for encounters around them
- To systematize, represent and respond rigorously to the images of the future produced by Chilean society.

In this sense, TQH incorporates Chamber's (2003) classic notion of deliberative democracies as “talk-centric”. It also reflects the idea that deliberation requires specific interpersonal values or procedures (ways of talking). This is consistent with Curato et al. (2017) notion of "deliberative attitudes" in which different actors should engage as peers in a mutual exchange of reasons and practical judgments. TQH (Tenemos Que Hablar de Chile, 2021) suggests that the principles that ought to guide this conversation are:

- Empathy
- Active listening
- Respect
- Plurality
- Transparency and symmetry
- Tolerance
- Collaboration
- Co-responsibility
- Appreciation for divergence
- Convergence as a possibility

The dialogue structure was designed by the Public Innovation Lab at Pontificia Universidad Católica de Chile (LIPUC) in collaboration with the Public Policy Center UC and the executive team of Tenemos que Hablar de Chile (Tenemos Que Hablar de Chile, 2021). In practice, each dialogue was orchestrated by a facilitator that guided participants throughout all four questions of the encounter:

1. Which has been the predominant emotion of the past week? (Affective states)
2. What do we have to change, improve or keep in Chile? [Conversation topics]
3. In relation to the prioritized topic by the group. How can we achieve that goal? [Political change mechanisms]
4. What can I do as a citizen to achieve that? [Personal commitment]

In each round of conversations, the facilitator registered and tagged each participant's interaction using a virtual board to increase transparency and fidelity of the registration and reduce the risk of information loss. Our team trained each facilitator to produce complete syntactic sentences using the SPOCA structure (Subject, predicate, object, complement, adjunct). These annotations and the tags made by facilitators were used as the source material for our analysis. In fact, one of the key innovations of this process in terms of data production is the fact that the analysis team was involved in the dialogue design itself to guarantee better inputs for the analysis. Producing basic linguistic training for facilitators and annotators is a quick improvement that other analysts could adopt. Moreover, this also speaks of how the different stages of the dialogue process impact analysis, which is discussed further in the final section of the article.

The analysis team

Our team consisted of a social scientist specialized in social research within Science and Technology, a philosopher specialized in modern linguistics and informal logic, and a data scientist specialized in text analysis and natural language processing. It was the first project in which we worked as a team. We agreed that we needed to differentiate our analysis from a descriptive-only approach using standard NLP techniques from the very start of our collaboration process. This, because of some of our previous participatory experience in similar tasks in which the standard end-results tended to underwhelm relevant stakeholders and information users. In this sense, we soon realized that we shared a similar diagnosis of the situation: Dialogue organizers tend to lack understanding of what can actually be achieved with unstructured text, leading to unexpressed and unrealistic expectations of the results. This may also relate to the expectation that public opinion is a monolithic-like entity with strong internal logic and produces slight variance. The very question that it seemed we had to address had these implications: What does Chile think?

Understanding dialogue initiatives as a complex process

Through our interdisciplinary approach, we produced incremental deliverables to our stakeholders (initiative organizers). As we mentioned before, these deliverables focused on particular analytical categories (futurization and argumentation) or our Computational Grounded Theory approach. However, to fully understand the analysis process, we assert that it needs to be described in terms of the overall dialogue initiative. This, because both previous stages of the process affect the quality and nature of the data, and later processes affect how the analysis is constructed as public knowledge.

Through our methodological experience, we suggest that researchers should think of these public initiatives at least through the lens of three different strategic moments. It must be stated that these movements may be conducted by the same people or by other teams.

First moment – Designing, conducting, and registering: The process of inviting participants, selecting the elicitation probes (open-ended questions most of the time), conducting the workshops, and registering information are key for the analysis process in multiple senses. For once, the GIGO (Garbage-In Garbage-out) rule applies; the analysis is only as robust as the information used as input. In practice, this means thinking about accuracy, validity, completeness, and availability (Kilkenny & Robinson, 2018). In our case, completeness of the sentences registered was crucial for the syntactic-level assessment and was intentionally promoted through facilitator training. Having a human register the data instead of a machine was also a conscious decision. It is based on the idea that humans want to be heard by humans. In this sense, having facilitator training and having participants validate in real-time the annotations is an inventive solution for high-stakes deliberation contexts. It may also have us question the limits of automatization in sensitive democratic contexts.

In a deeper sense, choosing questions also tends to imply certain analysis compromises and decisions. For instance, the first question of the conversation (*Which has been the predominant emotion of the past week?*) heavily compromised using some sort of visualization of emotions and made it difficult to explore other techniques. More generally, we observed that questions illuminate some analysis decisions and obscure others. For these reasons, we assert that analyzers should be involved during this first moment to anticipate how certain probes relate to analysis decisions and how to procure a good quality of raw data.

Second moment: Systematizing, analyzing, writing: This is the process we detail in the following section. It entails organizing the information as a processable data set, cleaning and pre-processing, conducting the analysis and also (sometimes omitted element) writing reports. One of the benefits of working in interdisciplinary teams is complementing skills. Social scientists, for instance, do most of the time have the relevant writing skills to translate statistical outputs into substantive interpretations and can more time-efficiently write the verbal parts of the reports (as you can imagine, a social scientist wrote this phrase in the article).

Third moment: Regulating, communicating, and politicizing: In most cases, technical and political communication are two very different ballgames. For instance, in our case, we had internal stakeholders (the initiative organizers and funders) to which we reported to. These actors also serve the role of public discourse regulation (Niemeyer, 2020) to varying degrees of reflexivity. In this context, discourse regulations mean filtering, re-interpreting, prioritizing, and framing the different results of the process into politically meaningful snippets, interview content, newspapers editorials, and public reports. There is, of course, a significant question to be explored around how information changes from one moment to another. Beyond that, there is also a question of how to harness the political skills of these actors to find politically meaningful questions to ask our dataset. This, of course, is in

the understanding that data is a form of power and thus a political phenomenon (Iliadis & Russo, 2016).

Figure 1 summarizes our conceptualization of how a traditional institutional dialogue is conducted.

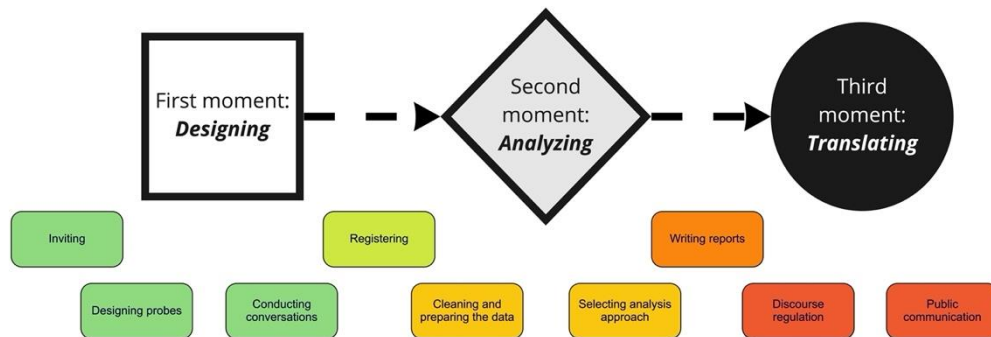


Figure 1. A three-moment model of institutional dialogue initiative

Understanding institutional dialogue initiative as complex processes is crucial in order to contextualize analysis steps within a sequence of other mutually-constructing but qualitatively different steps. The qualities of the conversation probes highly affect analysis decisions, and the quality and thought put into data registration is crucial for the validity of the analysis. On the other hand, verbally explaining findings to the stakeholder affects what is communicated to the broader public, however, that relationships is not mechanical, as the nature of the communication can greatly change from the analyst's reports to the public reports. Using a Wittgensteinian (1953) approach, one may say that the language game is very different.

Our interdisciplinary methodological approach

We organized our analysis plan into three deliverables:

- Futurization: Assessment of the images of the future produced by participants containing analytical categories drawn from future studies.
- Argumentation analysis: Assessment of the argumentation complexity shown by participants as portrayed by analytical categories drawn from argumentation theory.
- Descriptive analysis: Computational Grounded Theory process adapted to constructively and inductively describe and organize opinions by the participants in each of the dialogue questions.

In the following sections, we will explain and revise our methodological experience conducting these different analyses.

Creating analytical categories

In order to move beyond description and into analysis, we decided that our assessment strategy needed to address the following steps:

1. Identify social science theories and models that may relate to the available corpus of text and the initiative aims.
2. Identify robust normative expectations in these theories about how social dialogue “should be”.
3. Operationalize these ideal speech scenarios into linguistic markers that emphasize syntactic structures over semantic interpretations.
4. Test the programmability of these markers using available NLP techniques such as n-grams extraction, lemmatization, Part Of Speech tagging, and syntactic parsing, these last two using the available Spanish models included in the Stanford CoreNLP packages.
5. Assess the corpus of text with the final and tested markers
6. Evaluate whether the numerical results can lead to substantive interpretations

In this sense, our methodological approach can be summarized as going from the social sciences to data science through linguistics and then back from data science to the social sciences.

After much debate, we decided to call our process and its end result of a programmable, operationalized and normative expectation based on social theory "analytical categories" (authors, 2021). These analytical categories differ from traditional ontology learning methods (Asim et al., 2018) because the purpose is not to inductively extract a text's internal logic but rather to compare a text to external conceptual criteria. In this sense, creating analytical categories requires the mapping of a knowledge domain rich in critical discussions. Figure 2 summarizes this construction process.

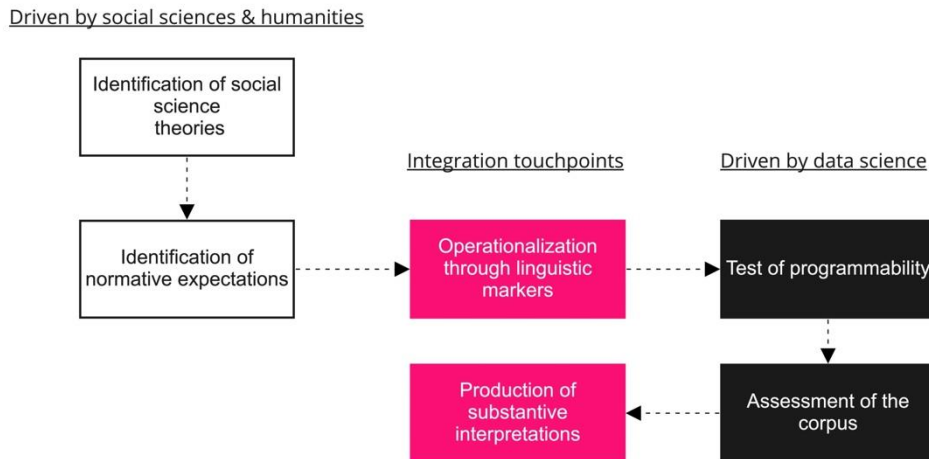


Figure 2. Construction process of analytical categories

As shown by figure 2, this process involves the application of an interdisciplinary approach. In this process, the operationalization of theory into linguistic patterns and the substantive interpretation of the final results operate as the “trading zones” (Galison, 2010) between the social science and data science.

For the purposes of our analysis, we focused on three different knowledge domains:

Future studies: In consideration that the goal of this initiative was to sustain conversations about the future of the country, we decided to review the field of Future Studies to identify conceptual models that expressed ideal situations of “talk” about the future. There is also an argument to be made that all conversations about political change are also future-oriented due to the pragmatic context of their speech. In particular, we were interested in the normative assumptions described by the Futures Literacy Framework (e.g. Miller, 2018; Poli, 2018), for instance, regarding the need to think about the future in terms of true novelty instead of just a continuation/extrapolation of the current trends. Based on their conceptual description, we constructed an analytical category called “entropization” (authors, upcoming) that served to classify the degree to which opinions talk about the future in terms of the past or as novelty. As another example, we also reviewed the available literature on Future Images (e.g., Polak, 1971; Topcu & Hirst, 2019) and noticed that in constructing and analyzing future images, the active implication of the speaker is crucial dimension. From that insight, we constructed an analytical category called “agency” that we then operationalized through the conjugation of verbs and the syntactic subjects (authors, upcoming).

Argumentation theory: One of the critical premises of public deliberation is that “deliberation entails civility and argumentative complexity” (Dryzek et al., 2019, p. 1145). To test this premise and assess the argumentative properties of this body of text we

conducted an assessment based on argumentation theory and informal logic. For instance, based on Marraud (2014) and critical debate models (authors, 2021), we created an analytical category called “type of opinion” (Authors, upcoming) that reflects the notion that there are specific elements that are required in argumentation, for instance, points of view followed by developed reasons and sometimes even evidence. Based on this insight, we operationalized the use of conclusive particles (such as because, since, therefore, etc.) and conclusive particles that introduce a complex indirect object, that is, it contains more than a substantive nucleus and an adjective. (for example, subordinate phrases, adverbial forms, etc.). We categorized the type of opinions into discrete options through this operationalization, from fully-formed arguments to expressive points of view.

Social epistemology: Another of the premises of public deliberation is the aspiration of inclusion (Karpowitz & Chad, 2020) and the uptake of others' perspectives. However, taking up what others have to say can be hard to achieve when there is a substantive disagreement (Scudder, 2020). Because of this reason, and based on Fogelin (1985) distinction between deep disagreements and normal disagreements, we sought to understand what could instigate exclusion between disagreeing agents in a conversation. Drawing from Miranda Fricker's (2007) concept of epistemic injustice and discussions in science communication around the “deficit model” (Cook & Melo, 2019), we proposed a series of analytical categories to describe different forms of deficit attributions between disagreeing agents. For instance, we proposed the idea of deficit in “epistemic confidence” (authors, 2021) to signal that a low level of trust is attributed to the counterpart's testimony or that a different interpretation is attributed to the explicit intentions of the counterpart. These analytical categories are still in the process of computational programming.

All of these different classes of analytical categories served to re-interpret our database and, in turn, re-interpreting its very nature. For instance, through the lens of Future Studies, our dataset was seen as *conversations about the future*. Through the lens of Argumentation theory, it's seen as an *argumentative exchange*. And through the lens of Social Epistemology, it was seen as *knowledge and power dynamics*. In this sense, we realized that, in effect, the analytical categories and framework used to make sense of data also co-constructs the nature of such text. That should make text-analysts wonder about the extent of the underdetermination (Knorr-Cetina, 1981) of our hypothesis.

Computational Grounded Theory

One of the requests by our stakeholders was the inclusion of more descriptive and direct forms of systematization. As a team, we were interested in incorporating our interdisciplinary expertise in substantively describing more traditional and descriptive NLP outcomes, such as wordtrees, wordclouds and other descriptive visualization of data. We utilized our expertise in content analysis using Grounded Theory (Strauss & Corbin, 1994) to analyze these visualizations, adapting Nelson (2020) method for Computational Grounded Theory. Nelson (2020) proposed a three-step method for combining structural

topic modeling with Grounded Theory analysis. We adapted these three steps and added a first stage in the following manner:

1. Pattern exploration: Nelson (2020) proposes a methodology that starts with a computational organization of text. However, we assert that a qualitative manual reading of random subsets of data points is fundamental for the analysis process. This, because researchers need to habituate themselves to the qualities and complexities of material they aim to give form. In our case, this exploratory phase was manifested in team meetings and shared documents in which we discussed patterns and characteristics of the data. For instance, we discussed how certain annotators syntactically constructed their registrations in ways that algorithms would miss data, by starting with gerunds or by using a tacit subject –which are very common in informal Spanish. We also discussed how verbs were possible markers of semantic content (i.e. that one could almost predict how people lean towards a topic based on their choice of verbs).
2. Pattern identification: As proposed by Nelson (2020), the pattern identification process was conducted computationally through automatic and inductive NLP methods, such as tokenization, stemming, and lemmatization. These grammatical units were then organized, counted, and visualized through methods such as Wordclouds and Wordtrees. These visual outcomes served as the descriptive phase of a Grounded Theory Analysis. We also wrote down and discussed substantive interpretations of these results following the procedures for theoretical memoing (Birks et al., 2008). It is noteworthy that this would traditionally be a significant portion of the end-products delivered to the relevant stakeholders.
3. Pattern refinement: Through an iterative process, we went back and forth to the original data to figure out if the substantive interpretations that we produced interpreting the results of the previous phase made sense when reviewing representative text extracts. More crucially, the refinement process allowed for a better selection of the core concept in our wordtrees and selection criteria in our wordclouds.
4. Pattern confirmation: Nelson (2020) proposed a series of alternatives for quantitatively testing the proposed descriptive models in the previous stages with the overall dataset. However, adopting a constructivist approach to Grounded Theory means moving beyond objectivist approaches to validity and focusing on self-reflection and relational analysis (Charmaz, 2017). Because of this, we used "triangulation" to assess the validity of the end results. In particular, we combined theory triangulation and method triangulation to discuss how our different extraction methods and theoretical frameworks relate, converge or contrast with each of the visualizations produced. We also used investigator triangulation to reflect on the results in weekly meetings.

Figure 3 summarizes this process.

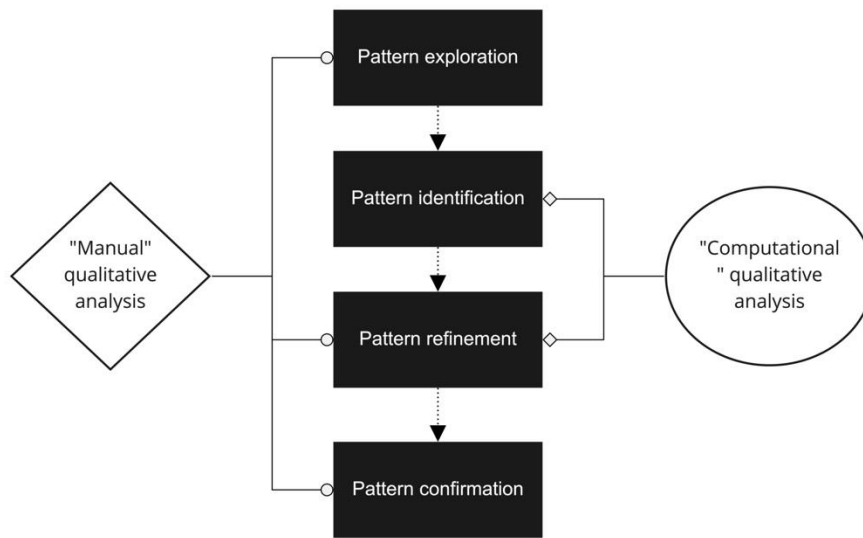


Figure 3. Adapted methodology for computational grounded theory

As seen in Figure 3, our approach is based on an incremental and interactive back-and-forth from models to data combining traditional “manual” qualitative assessment with “computational” data science methods. The quotation marks signal that this distinction between manual and computational is in practice less clear. We used computers and computer programs for conducting “manual” qualitative research and coding in Python requires quite a bit of “manual” labor, both to literally do coding by hand and also in the human subjective criteria it takes to write codes and select between analysis options.

In our case, we were interested in understanding how people spoke of the most prioritized topics during the second question of the dialogue (*What do we have to change, improve or keep in Chile?*). During this question, dialogue participants were asked to prioritize one of the mentioned responses in order to deepen in the subsequent stages of the conversation. The most frequently prioritized topics were in order: Education (29.1%), Political constitution (24.1%), Healthcare (8.4%), and Pensions (5.2%).

Through a refinement process (reflectively going back and forth to the data), we soon discovered that the linguistic behaviors changed significantly when choosing the core elements for the analysis. For instance, in the specific case of "Education" we observed that when Chileans talk about '*changing education*', it entailed broader political ideals of equity and justice. Still, when people talk about '*improving education*,' the discussion shifted towards more concrete problem-solving-driven arguments about curricula, infrastructure, financing, and teacher formation. Additionally, when we analyzed the word “include”, it reflected specific changes to the curricula.

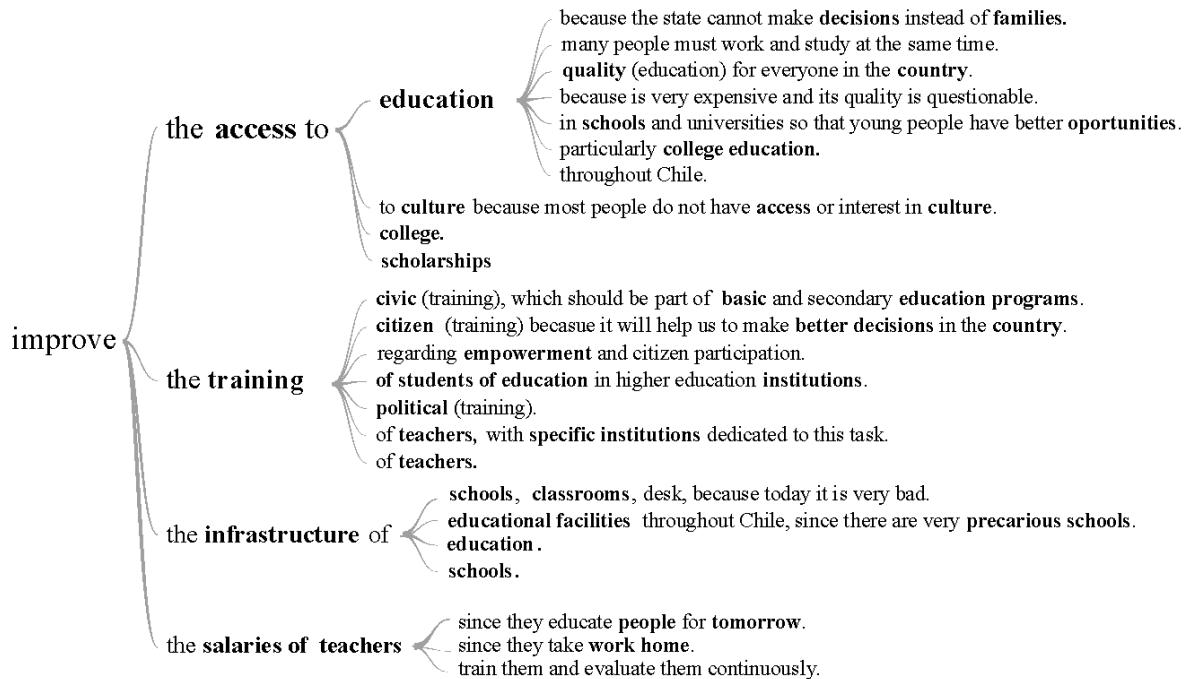


Figure 4. Wordtree for “improve” in discussions about education

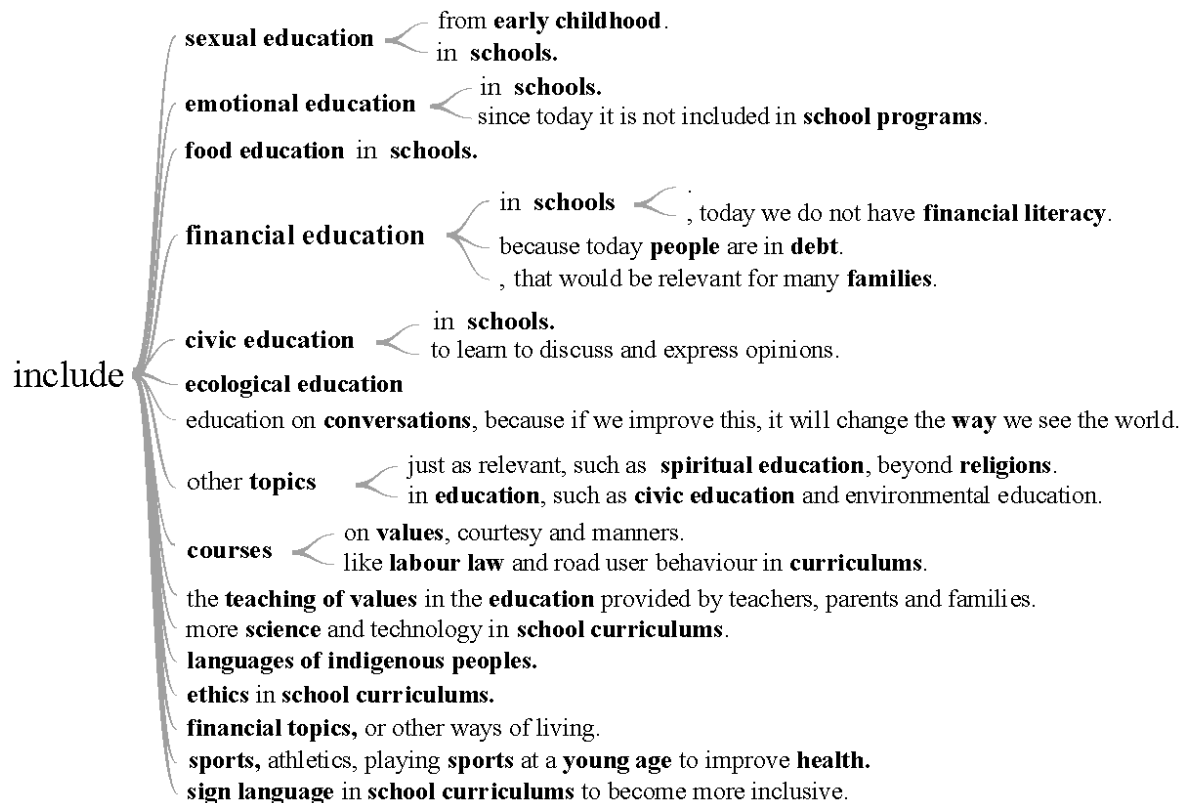


Figure 5. Wordtree for “include” in discussions about education

One of the key learnings from our approach to Computational Grounded Theory was understanding that specific linguistic selections tend to promote specific linguistic behaviors that are, to an extent, topic-specific. Because of this, the pattern refinement process requires an iterative reflective back and forth to the original text to figure out and theorize why certain concept selections elicit particular behaviors.

The product of an analysis

Our analysis reports were translated (through the third movement) into public media posts, interviews, and a final report posted on the website at the end of the process. This report was based on our systematization but also on focus groups with the facilitators and coordinators. Ultimately the initiative leaders organized the results into ten takeaways (Tenemos Que Hablar de Chile, 2021):

1. Our coexistence in diversity and complementarity: Pointing out that Chileans are diverse but agree on the need for dialogue as the fundamental political mechanism
2. In-between uncertainty, insecurity, and hope: Pointing out that the primary political emotion is uncertainty and insecurity, but there is also a presence of hope
3. Change as resetting. Politics in citizenship and its institutional perspective: Pointing out the fact that Chileans express a desire for structural change and radical renewal of the political class
4. A “responsive” state: Pointing out that participants view the state as the central actor for change that has currently been absent or negligent
5. A new political praxis, a central Challenge for the new constitution: Pointing out that opinions on the new constitution reflect an aspiration of the new political arrangement centered on the everyday citizen.
6. A public ethic: Pointing out that politicians and institutions need to be upheld to higher ethical standards
7. Education as a national project: Pointing out the perception that changes in the educational system are viewed as the center of our national future
8. Empathy, solidarity, and resilience as a matter of identity: Pointing out that participants view the values of empathy, solidarity and resilience as something to keep in this new political age and as a part of the national character.
9. Participation as bond and citizen oversight: Pointing out that the personal commitments of the participants related to taking part in more participatory instances and that participation will be key in the future for sustaining our national bonds and supervising political change.
10. In the micro, everyday life, work and economic urgencies: Pointing out to the fact that participants tended to center the discussions around the economic dimensions of our national challenges, but not in macroeconomic terms (such as GDP or economic growth) but rather on the micro (salaries, the cost of living, access to quality public goods).

After its release, some public media outlets and political analysts have stated that this exercise predicted the unexpected voting in which Chileans elected mostly independent citizens to write our new constitution held on May 15 (see Ferrer, 2021). Most of this connection was based on the emphasis given by the report on growing discontent with the political class. Figure 6 shows a public tweet (anonymized) reflecting on this same interpretation.



Figure 6. Public tweet. Own translation: “Because if we don’t change ‘the politicians’ we can’t change anything”: One of the literal phrases of the study *Tenemos que Hablar de Chile* that Ignacio Irarrázaval from @cppublicasuc [Public Policy Center – leading member of TQH] and that allows for a better understanding of the election results: “This was foretold: the upset was too strong”.

As a research team, this led to some interesting introspections about the purposes of public engagement analysis beyond prediction. First of all, one must wonder about the validity of such post-hoc assertions as other possible aspects of our data may have been used to “explain” other trajectories. For instance, the fact that the report stated that Chileans expressed a desire for dialogue may have been used to explain why they elected more traditional and conservative figures to write the new constitution. This reminds of the notion of “interpretative flexibility” (Bijker, 2017) of technological artifacts that allows socially relevant groups to lead the social construction of the artifact (in this case, a data analysis) into different directions using processes of rhetorical closure (Pinch & Bijker, 1987). This is also consistent with the notion of data as “rhetorical moves” (Neff et al., 2017) that construct social discourse rather than only explain.

But what are the purposes of such an analysis of public engagement initiative if not to “predict” political outcomes or inform stakeholders about the future? Deliberation processes as a whole were traditionally considered to be about citizen control and direct, consequential outcomes to policy (Collins & Ison, 2009; Slotterback & Lauria, 2019). Public engagement is often seen as necessary, especially when policy issues are too complex or wicked (Carcasson, 2016). However, in this era of “communication plenty” (Ercan et al., 2019) within western democracies, it is no longer the case that problem-solving and control are the only purposes of dialogue. For instance, the notion of “learning” has been widely adopted within the literature (Carcasson & Sprain, 2016; Collins & Ison, 2009), understanding conversations as spaces for cyclical social learning. In our case, as this initiative was not organized by any state institution, it wasn't linked to any horizon of

concrete policy decisions. Instead, as we previously mentioned, the projected objectives were to

- To push for massive social dialogue about the country's challenges
- To promote a way of talking that values differences and allows for encounters around them
- To systematize, represent and respond rigorously to the images of the future produced by Chilean society.

The dialogue was seen as good in itself, whose ulterior objective was to incentivize more dialogue through certain procedural assurances (rigorous analysis). In other words, the ethos of the project was "dialogue for more dialogue". But what specifically justifies this dialogue as a priori good? Our best guess would precisely be the processual dimension, not particularly regarding the analysis, but rather the process of enacting the intended values of deliberation inside a sort of formative experience that should reflect how public dialogue is performed outside of it. In this interpretation, TQH would mean a learning experience to explore and develop the 'deliberative attitudes' (Curato et al., 2017) needed for social coexistence. Interestingly enough, the last two values listed by TQH (Appreciation for divergence & Convergence as a possibility) already reflect the tensions in the liberal and classical aspiration for rational consensus as to the purpose of the conversation.

Perhaps ironically, the dialogue design forces participants to reach an agreement and vote on which topic to discuss in depth. This may be interpreted as a theoretical inconsistency of the design, but other interpretations may also be attributed. Strictly speaking, when participants are asked to agree on a topic, they are not asked to reach a consensus of opinion (content) but rather on a discursive space. This is consistent with Dryzek & Niemeyer (2006) idea of meta-consensus as a preferable end of deliberation. Meta-consensus may be normative, epistemic, or of preferences. Normative meta-consensus means agreeing on the range of legitimate values that may be involved in the topic (in our case, the list is proposed by the organizers). Epistemic meta-consensus refers to the credibility and appropriateness of the evidence and beliefs involved in the discussion, regardless of my personal position on the conclusion. This form of consensus may be hard to reach when dealing with deep disagreements (Fogelin, 1985) or in the presence of epistemic injustice (Fricker, 2007). Finally, preference meta-consensus refers to the range of options and decisions that can be considered legitimate regarding their relevance for a particular phenomenon. Overall, regardless of the specific form of meta-consensus, in practice, it means for participants not only to understand what the position of others is but also why they adhere to it (Niemeyer, 2011). This more modest interpretation of meta-consensus may serve as a basic guide to purposes of public dialogue in our experience.

Overall, we assert that the importance of drawing from social theory and working with social scientists and philosophers is not only as a means to find new analysis ideas but rather, to incorporate the critical, political, and epistemological points of view that those intellectual traditions have examined. In our case, that meant trying to conceptualize the

analysis process as part of larger socio-technical processes in which the different parts (or movements) relate to each other and open up questions about fidelity, power, and translation. Moreover, it allows for a critical understanding of the extended life of our reports and conclusions beyond our deliverables and into the public, which to us ultimately led to questions about the purpose of dialogue itself.

Discussion

In this article, we sought to present an experiential account of a multidisciplinary team engaging in a collaborative process for analyzing the largest yet series of institutional public engagement. In this sense, this article is an effort to describe through a holistic and critical approach, how digital technologies (such as NLP) are used for addressing a democratic crisis. In other words, how technology is used by institutions for the people. Initially, we aimed to conceptualize how data analysis is always part of larger institutional process and interconnected steps of designing and translating. Our work as analysts cannot be separated from that larger sociotechnical system.

As a team we aimed at making our results more robust by means of combining the depth of social science with the efficacy of data science. We sought to apply social science theories and operationalize them through modern linguistics to guide a more theoretically-informed natural language processing. The analysis was divided into three stages: (1) a descriptive analysis utilizing traditional NLP techniques combined with qualitative content analysis, (2) a futurization analysis operationalizing concepts from futures studies, and (3) an argumentative analysis operationalizing concepts from argumentation theory. Overall, our methodological experimentation shed light on potential learnings for integrating a multidisciplinary perspective on NLP analysis with political content. Firstly, we developed a strategy for translating knowledge based on the construction of what we called "analytical categories" in which a normative expectation or descriptive dimension was identified in the body of literature. Afterward, the team revised the syntactic structures that may correlate to that category. Finally, the operationalized "analytical category" was programmed in Python. The posterior analysis was possible due to NLP operations such as n-grams extraction, lemmatization, Part Of Speech tagging, and syntactic parsing, these last two using the available Spanish models included in the Stanford CoreNLP packages.

The two methodological approaches we describe in this article reflect two distinct ways to articulate social science and data science. Figure 7 summarizes both approaches.

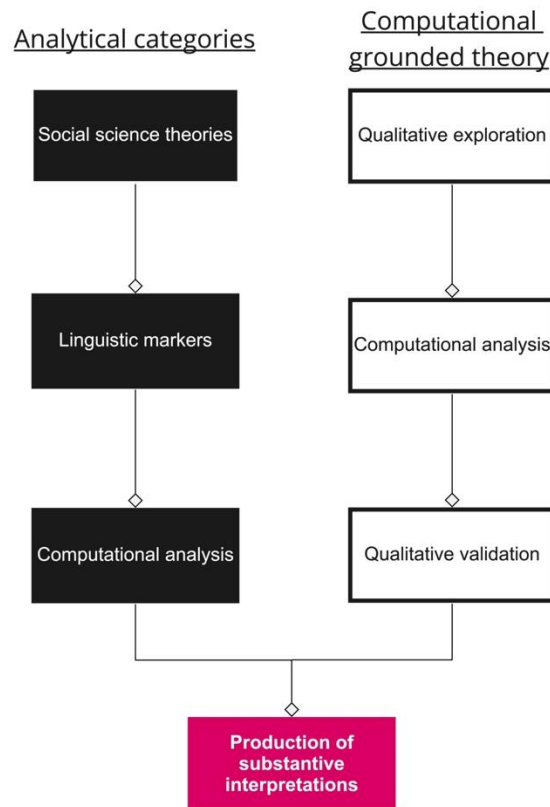


Figure 7. Summary of both interdisciplinary approaches

In the one hand, in our “analytical categories” approach, the social sciences are integrated as theories that provide normative expectations. In other words, they are included as bodies of knowledge. On the other hand, in our adaptation of computational grounded theory, social science is integrated through its development of qualitative analysis. In other words, it is included as a way of knowing. In both cases, linguistics presented itself as the principal means of that articulation process, as the hinge that kept everything together.

The original first part of the title of this article was “A social scientist, a philosopher, and a data scientist walk into a bar” (we removed it to shorten the title) because we felt there is also an amount of humor in what we do, not only because we enjoy our jobs, but also because in our experience, interdisciplinary work is filled with moments of awkwardness when members of the team used technical terms without perceiving that others are not following, or we are just amazed of how their part of the work entertains the others. What we tried to reflect on in this article is that interdisciplinary data analysis is as much a methodological process as a political process as an interpersonal process. All dimensions are at work at different levels and moments.

Interdisciplinary data analysis is also an iterative process. For instance, in a new project being developed at the moment of writing this article, we realized that our approach of combining analytical categories and computational grounded theory could also be enriched by constructing data ontologies based on exploratory qualitative research with stakeholders and users. There is much to be learned and improved, especially if we consider that ideas can be easily shared in a globalized world. By the time of writing this article, Colombia announced they'd be conducting their own *Tenemos Que Hablar de Colombia*, and our analysis strategy may serve as a reference for their process too.

Through this method, we have been able to explore new analysis options with potentially relevant results. A future publication may also involve developing systematic guidelines for adopting and discussing our methodological approach.

Ultimately, we assert that data science approaches to democratic challenges require an interdisciplinary approach to achieve more substantive results but primarily due to the level of responsibility involved in politically sensitive situations such as the one we experienced in our context. When conversation initiatives lack clarity regarding their purposes (especially if they are not directly linked to political action) or fail to produce meaningful systematized results, they run the risk of diminishing public trust in institutional engagement. Because of this reason, there is also a need for instilling more critical reflection not only for achieving better results but for asking challenging questions, such as; What counts as meaningful results? For whom and why? How does my analysis connect to wider political and socio-technical processes? We hope that through our ideas and interpretations, we can help to ignite these questions and more into the academic and professional endeavor of interdisciplinary data analysis.

References

- Asim MN, Wasim M, Khan MUG, et al (2018) A survey of ontology learning techniques and applications. Database 2018:. <https://doi.org/10.1093/database/bay101>
- Bader V (2014) Sciences, politics, and associative democracy: democratizing science and expertizing democracy. *Innov Eur J Soc Sci Res* 27:420–441. <https://doi.org/10.1080/13511610.2013.835465>
- Barredo Arrieta A, Díaz-Rodríguez N, Del Ser J, et al (2020) Explainable Artificial Intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI. *Inf Fusion* 58:82–115. <https://doi.org/10.1016/j.inffus.2019.12.012>
- Bijker W (2017) Constructing Worlds: Reflections on Science, Technology and Democracy (and a Plea for Bold Modesty). *Engag Sci Technol Soc* 3:315. <https://doi.org/10.17351/ests2017.170>
- Birks M, Chapman Y, Francis K (2008) Memoing in qualitative research. *J Res Nurs* 13:68–75. <https://doi.org/10.1177/1744987107081254>
- Brown MB (2015) Politicizing science: Conceptions of politics in science and technology studies. *Soc Stud Sci* 45:3–30. <https://doi.org/10.1177/0306312714556694>

- Campagnolo GM (2020) Social Data Science Xennials. In: Social Data Science Xennials. Springer International Publishing, Cham, pp 1–18
- Carcasson M (2016) Tackling Wicked Problems Through Deliberative Engagement. *Natl Civ Rev* 105:44–47. <https://doi.org/10.1002/ncr.21258>
- Carcasson M, Sprain L (2016) Beyond Problem Solving: Reconceptualizing the Work of Public Deliberation as Deliberative Inquiry. *Commun Theory* 26:41–63. <https://doi.org/10.1111/comt.12055>
- Carrozza C (2015) Democratizing Expertise and Environmental Governance: Different Approaches to the Politics of Science and their Relevance for Policy Analysis. *J Environ Policy Plan* 17:108–126. <https://doi.org/10.1080/1523908X.2014.914894>
- Charmaz K (2017) The Power of Constructivist Grounded Theory for Critical Inquiry. *Qual Inq* 23:34–45. <https://doi.org/10.1177/1077800416657105>
- Chilvers J, Kearnes M (2020) Remaking Participation in Science and Democracy. *Sci Technol Hum Values* 45:347–380. <https://doi.org/10.1177/0162243919850885>
- Collins K, Ison R (2009) Jumping off Arnstein's ladder: social learning as a new policy paradigm for climate change adaptation. *Environ Policy Gov* 19:358–373. <https://doi.org/10.1002/eet.523>
- Cook BR, Melo Zurita M de L (2019) Fulfilling the promise of participation by not resuscitating the deficit model. *Glob Environ Chang* 56:56–65. <https://doi.org/10.1016/j.gloenvcha.2019.03.001>
- Curato N, Dryzek JS, Ercan SA, et al (2017) Twelve Key Findings in Deliberative Democracy Research. *Daedalus* 146:28–38. https://doi.org/10.1162/DAED_a_00444
- Davies SR (2019) Democratic innovation in science and technology. In: Elstub S, Escobar O (eds) *Handbook of Democratic Innovation and Governance*. Edward Elgar Publishing, pp 297–309
- Daviter F (2019) Policy analysis in the face of complexity: What kind of knowledge to tackle wicked problems? *Public Policy Adm* 34:62–83. <https://doi.org/10.1177/0952076717733325>
- Dryzek JS, Bächtiger A, Chambers S, et al (2019) The crisis of democracy and the science of deliberation. *Science (80-)* 363:1144–1146. <https://doi.org/10.1126/science.aaw2694>
- Engin Z, Treleaven P (2019) Algorithmic Government: Automating Public Services and Supporting Civil Servants in using Data Science Technologies. *Comput J* 62:448–460. <https://doi.org/10.1093/comjnl/bxy082>
- Ercan SA, Hendriks CM, Dryzek JS (2019) Public deliberation in an era of communicative plenty. *Policy Polit* 47:19–36. <https://doi.org/10.1332/030557318X15200933925405>
- Ferrer C (2021) Los dos estudios que adelantaban el rechazo a los políticos y el descontento ciudadano previo a las elecciones. *Emol*
- Flick U (2020) Triangulation. In: *Handbuch Qualitative Forschung in der Psychologie*. Springer Fachmedien Wiesbaden, Wiesbaden, pp 185–199
- Fogelin R (1985) The logic of deep disagreements. *Informal Log* 7:1–8
- Fricke M (2007) *Epistemic Injustice: Power and the Ethics of Knowing*. Oxford University Press, New York

- Galison, P. (2010). Trading with the Enemy. In *Trading Zones and Interactional Expertise* (pp. 25–52). The MIT Press.
<https://doi.org/10.7551/mitpress/9780262014724.003.0003>
- Gastil J, Richards RC (2017) Embracing Digital Democracy: A Call for Building an Online Civic Commons. *PS Polit Sci Polit* 50:758–763.
<https://doi.org/10.1017/S1049096517000555>
- Greene D, Hoffmann AL, Stark L (2019) Better, Nicer, Clearer, Fairer: A Critical Assessment of the Movement for Ethical Artificial Intelligence and Machine Learning. In: *Proceedings of the 52nd Hawaii International Conference on System Sciences*. Grand Wailea, Hawaii, pp 2122–2131
- Iliadis A, Russo F (2016) Critical data studies: An introduction. *Big Data Soc* 3:205395171667423. <https://doi.org/10.1177/2053951716674238>
- Jasanoff S (2016) *The Ethics of Invention: Technology and the Human Future*. W.W. Norton & Company, New York
- Kilkenny MF, Robinson KM (2018) Data quality: “Garbage in – garbage out.” *Heal Inf Manag J* 47:103–105. <https://doi.org/10.1177/1833358318774357>
- Knorr-Cetina K (1981) Time and Context in Practical Action: Underdetermination and Knowledge Use. *Knowl Creat Diffus Util* 3:143–165
- Krick E (2018) The epistemic quality of expertise: contextualized criteria for the multi-source, negotiated policy advice of stakeholder fora. *Crit Policy Stud* 12:209–226. <https://doi.org/10.1080/19460171.2016.1258317>
- Lago N, Marianne D, Pouleur J-A, et al (2019) Citizen Participation through Digital Platforms: the Challenging Question of Data Processing for Cities. In: *Proceedings of the Eighth International Conference on Smart Cities, Systems, Devices and Technologies*. IARIA, Nice, pp 19–25
- Lövbrand E, Pielke R, Beck S (2011) A democracy paradox in studies of science and technology. *Sci Technol Hum Values* 36:474–496.
<https://doi.org/10.1177/0162243910366154>
- Miller R (ed) (2018) *Transforming the future: anticipation in the 21st century*. UNESCO-Routledge, Paris-Oxford
- Moats D, Seaver N (2019) “You Social Scientists Love Mind Games”: Experimenting in the “divide” between data science and critical algorithm studies. *Big Data Soc* 6:205395171983340. <https://doi.org/10.1177/2053951719833404>
- Neff G, Tanweer A, Fiore-Gartland B, Osburn L (2017) Critique and Contribute: A Practice-Based Framework for Improving Critical Data Studies and Data Science. *Big Data* 5:85–97. <https://doi.org/10.1089/big.2016.0050>
- Nelson LK (2020) Computational Grounded Theory: A Methodological Framework. *Sociol Methods Res* 49:3–42. <https://doi.org/10.1177/0049124117729703>
- Niemeyer S (2011) The Emancipatory Effect of Deliberation: Empirical Lessons from Mini-Publics. *Polit Soc* 39:103–140. <https://doi.org/10.1177/0032329210395000>
- Niemeyer S (2020) Deliberation and ecological democracy: from citizen to global system. *J Environ Policy Plan* 22:16–29. <https://doi.org/10.1080/1523908X.2019.1661232>

- Niemeyer S, Dryzek JS (2007) The Ends of Deliberation: Meta-consensus and inter-subjective rationality as ideal outcomes. *Swiss Polit Sci Rev* 13:497–526.
<https://doi.org/10.1002/j.1662-6370.2007.tb00087.x>
- Noveck BS (2017) Five hacks for digital democracy. *Nature* 544:287–289.
<https://doi.org/10.1038/544287a>
- Patel M, Webb H, Jirotko M, et al (2019) Harnessing interdisciplinarity to promote the ethical design of AI systems. In: Griffiths P, Kabir MN (eds) *ECIAIR 2019 - Proceedings of European Conference on the Impact of Artificial Intelligence and Robotics*. Academic Conferences and Publishing International, Oxford, UK
- Pinch TJ, Bijker WE (1984) The Social Construction of Facts and Artefacts: or How the Sociology of Science and the Sociology of Technology might Benefit Each Other. *Soc Stud Sci* 14:399–441. <https://doi.org/10.1177/030631284014003004>
- Polak F (1971) *The image of the future*. Elsevier, Amsterdam
- Poli R (2018) A note on the classification of future-related methods. *Eur J Futur Res* 6:.
<https://doi.org/10.1186/s40309-018-0145-9>
- Procter R, Arana-Catania M, van Lier F-A, et al (2021) Citizen Participation and Machine Learning for a Better Democracy. *Digit Gov Res Pract* 3452118.
<https://doi.org/10.1145/3452118>
- Raphael C, Karpowitz CF (2020) Ideals of Inclusion in Deliberation. *J Deliberative Democr* 12:.
<https://doi.org/10.16997/jdd.255>
- Robinson DKR, Simone A, Mazzonetto M (2020) RRI legacies: co-creation for responsible, equitable and fair innovation in Horizon Europe. *J Responsible Innov* 1–8.
<https://doi.org/10.1080/23299460.2020.1842633>
- Scudder MF (2020) The Ideal of Uptake in Democratic Deliberation. *Polit Stud* 68:504–522.
<https://doi.org/10.1177/0032321719858270>
- Slotterback CS, Lauria M (2019) Building a Foundation for Public Engagement in Planning. *J Am Plan Assoc* 85:183–187. <https://doi.org/10.1080/01944363.2019.1616985>
- Strasser BJ, Baudry J, Mahr D, et al (2018) “Citizen Science”? Rethinking Science and Public Participation. *Sci Technol Stud* 52–76. <https://doi.org/10.23987/sts.60425>
- Strauss A, Corbin J (1994) Grounded Theory Methodology: An Overview. In: N. K. Denzin; Y. S. Lincoln (ed) *The Sage Handbook of Qualitative Research*. SAGE Publications, Thousand Oaks, pp 443–466
- Tenemos Que Hablar de Chile (2021) *Un país que se piensa y se proyecta: Diez hallazgos desde un Chile a Escala*. Santiago
- Topcu MN, Hirst W (2019) Remembering a nation’s past to imagine its future: The role of event specificity, phenomenology, valence, and perceived agency. *J Exp Psychol Learn Mem Cogn*. <https://doi.org/10.1037/xlm0000746>
- Weingart P, Joubert M, Connaway K (2021) Public engagement with science—Origins, motives and impact in academic literature and science policy. *PLoS One* 16:e0254201.
<https://doi.org/10.1371/journal.pone.0254201>
- Wittgenstein, L. (1953). *Philosophical Investigations*. Wiley.