Quali-Quantitative
(or non-binary) Methods
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Quali-quantitative methods are research techniques do not comply with the norms and expectations of both qualitative and quantitative research. This definition is deliberately vague and emphatically negative. Indeed, a more precise name for these techniques would be "neither-quali-nor-quantitative methods" or "non-binary methods" since this approach is less interested in combining the best of the qualitative and quantitative world – a program better identified by the label "mixed methods" – than in breaking free from the constraints of both.

To delineate more precisely the idea of quali-quantitative methods and describe these methods more positively (describing them for what they are and not just for what they are not), this entry discusses the way in which these methods are inspired by the STS tradition and enabled by digital records and analytic techniques. While it would be wrong to reduce the idea of a *non-qualitative-non-quantitative research* to the practice of digital methods, the latter offers today the most developed example of a quali-quantitative approach to social research. Accordingly, this entry dedicates much attention to digital methods, but focuses on their general methodological orientation rather than their specific implementations.

After (1) a description of how the quali/quantitative divide is classically instantiated in the social sciences, the entry (2) discusses how such a divide became untenable as STS scholars started to consider how science and technology shape and are shaped by their interaction with the rest of society. If the desire to overcome the quali/quantitative divide was felt early in the STS, such overcoming became fully possible only with the advent of digital records and digital computation. The entry thus (3) presents digital methods as quali-quantitative techniques and (4) distinguishes them from other approaches in computational social sciences.

1. The quali/quantitative divide

In 2016, Vincent Traag and Thomas Franssen tried an interesting experiment. They extracted the most relevant terms from the titles and abstracts of all the articles published between 2010 and 2015 in journals classified in sociology by the Web of Science. They then created a network of the bibliometric associations between these terms and explored it visually. The results were unequivocal: rather than by sub-disciplines or topics, the network split according to a binary cleavage between publications using terms such as case study, identity, narrative, discourse, and meaning, and publications mentioning data, association, survey, rate and size. This separation corresponds roughly but unmistakably to a divide between qualitative and quantitative methods, which is as old as sociology and apparently still dominant in social research.

While it is impossible to pinpoint an exact date for the emergence of the quali-quantitative divide, the history of the social sciences is laden with epistemological and methodological controversies that can be related to such a divide. Traag and Franssen (2016) connected the cleavage in their network to the foundational opposition between the "sociology" of Auguste Comte and the "social physics" of Adolphe Quetelet, in the first half of the 19th century. Others traced it back to the controversy between the social psychology of Gabriel Tarde and the *sui* generis sociology of Emile Durkheim at the turn 20th century, or to the opposition between the universities of Chicago and Columbia and their respective preferences for case studies and statistical methods. The divide probably reached its peak in the '70s and '80, when it was reframed as an insurmountable epistemological fracture and even as "paradigm war" between a positivist and a hermeneutic approach to social research (Bryman, 2008).

Since then, the opposition between qualitative and quantitative methods has lost most of its theoretical appeal and almost all the scholars who engaged with it in recent years have done so to critique or overcome it. Hammersley (1992), for instance, has deconstructed the quali/quantitative divide by articulating it in seven overlapping but distinct oppositions (words VS numbers; natural VS artificial settings; meanings VS behaviors; adoption VS rejection of the model of the natural sciences; inductive VS deductive approach; patterns VS law; idealism VS realism) and showing that none of them is as binary as it seems. From the '90s and 2000s, the quali/quantitative separation has been further challenged by the rise of "mixed methods" (Creswell 2003), an approach that, instead of denouncing the discrepancies between methodological traditions, suggests complementing them to strengthen research. This can be done by triangulating the findings obtained through qualitative and quantitative methods to confirm or specify each other; by using ethnographic analysis to generate hypotheses to test and generalize statistically or by using data analysis to identify trends to be examined through observation or interviews; or by combining the capacity of quantitative methods to highlight casual relations with the ability of qualitative methods to characterize their meaning.

Still, no matter how many scholars decry the quali/quanti opposition or suggest ways to overcome it, the results of Traag and Franssen's experiment reveal that this divide is still rampant in social research. And not without reason. Social phenomena are exceedingly complicated and, through the years, qualitative and quantitative methodologies have perfected two opposite, but equally efficient, strategies to deal with such complexity: *situation* and *aggregation*.

Studying *situated* phenomena with a qualitative approach means examining social actions in the time and place in which they occur. Qualitative methods allow for appreciating the richness of social situations and the way in which they create contained but fully-fledged social worlds. To be sure, situations are never completely removed from external interferences, but this does not mean that social actors themselves do not strive to preserve their relative self-containment. For example, when ethnographers observe a team of scientists on their benches, both the ethnographers and the scientists assume that the sterilization procedures of the laboratory and its institutional firewalls shield their activities from the rest of the world – while knowing all too well that no scientific laboratory could exist without a network facilitating the import of technical, human and financial resources and the export the research findings.

Quantitative *Aggregation*, on the other hand, allows extending the scope of social research focusing on specific observables (e.g., not individuals in their full complexity, but say their age or income) and concentrating on patterns and regularities. For example, when bibliometricians measure academic production, they work under the assumption that scientific publications are reliable proxies of scientific work – while also knowing that scientific achievements are made of much more than publications alone.

Through quantitative methods, we can skim over global trends. Through qualitative methods we can examine local interactions. Of course, this is a sweeping simplification and, of course, actual research protocols rarely respect such a neat separation, yet this is precisely the point of the quali/quantitative divide: to offer two simplified methodological archetypes that are easy to refer to and have proven productive in their respective spheres. Thanks to this divide, researchers interested in local interactions could observe them without having to mess with the tangle of influences that surround every social event. Likewise, researchers wanting 'the big picture' could have it without bothering about the single brushstrokes.

2. STS and the *glocal* networks of technoscience

While the quali/quantitative divide offers a convenient division of labor in social research, such a division only works as long as the black boxes of situation and aggregation are effectively maintained. The quali/quantitative divide only works, if local situations are sufficiently shielded from external influences (if, for instance, individual privacy is sufficiently protected) and if global architectures are upheld by a potent aggregation apparatus (if, for instance, state institutions are strong enough to enforce election tallies). It is difficult to maintain the idea of private encounters best studied by in-presence observation when interactions are increasingly assisted by media infrastructures financed in the main by the large scale monitoring of those interactions (Zuboff, 2019). Conversely, the idea of the state as a *sui generis* entity that can be investigated by focusing exclusively on collective structures is difficult to maintain when subversive individuals and micro-groups invade government buildings contesting the very electoral aggregation on which the state is based. When the boundaries of situation and aggregation waver, the division between qualitative and quantitative falls apart too.

The shortcomings of situation and aggregation have surfaced in social research time and again and numerous schools and traditions have tried to develop conceptual ways to overcome them. Beck's and Strauss' theory of social world, Gidden's sociology of structuration, Bourdieu's field theory, Luhmann's theory of social systems and several others approach have been developed with the deliberate goal of highlighting the interferences between micro-interactions and macro-structures – and thus offering conceptual equivalent to the mixed-methods approach discussed above.

If the situation/aggregation dichotomy appeared reductive to many research traditions, STS are arguably the field in which this dichotomy felt the most untenable. Through controversy analysis (cf. ENTRY IN THIS ENCYCLOPEDIA) and laboratory ethnography (cf. ENTRY IN THIS ENCYCLOPEDIA), STS scholars revealed the inextricable imbroglios of micro and macro, local and global, interactions and structures that constitute not the exception but the norm of science and technology. Far from being a self-referential or self-ruling domain as schoolbooks tend to present it, technoscience turned out to be influenced by and having influence on a variety of societal actors and factors. Following scientists and engineers *in action*, STS scholars

soon discovered a series of telescoping dynamics by which micro-interactions and macro-structures are articulated in the "centers of calculation" of technoscience (Latour, 1987). Academic and industrial laboratories derive their power precisely from the capacity to concentrate locally a series of resources coming from distant social spheres and to repackage them as black boxes capable of traveling to remote social situations.

These *situated-yet-global* dynamics became a central object of STS investigation and profoundly affected the intellectual development of the discipline. On the one hand, feminist and post-colonial STS denounced the idea of scientific knowledge as a view from above or from nowhere. Notions such as "situated knowledge" (Haraway, 1988) and "ontological multiplicity" (Mol, 2002) were introduced precisely to highlight how science and technology are always located within specific social groups and societal contexts (often the dominant ones) and how their normalization generalizes these standpoints at the expenses of those of other groups and contexts (often the subjugated ones). On the other hand, scholars coming from the lab-ethnography tradition developed concepts such as "boundary objects", "trading zone" and "socio-technical infrastructures" to describe how scientific theories and technological artifacts scale up and spread beyond the lab. Ideas such as "situational analysis" (Clarke, 2003) and "synthetic situation" (Knorr Cetina, 2009) encourage scholars to expand the tradition of symbolic interactionism from the here and now of traditional encounters to the larger networks of modern technoscientific societies.

The overcoming of the micro-macro / situation-aggregation dichotomy became the intellectual core of the so-called *actor-network theory* (cf. ENTRY IN THIS ENCYCLOPEDIA). As its name suggests, the objective of this theory is to describe the way in which social phenomena are constructed as relational effects – i.e., as heterogenous networks of actions binding together a multiplicity of actors, including people, technological artifacts, natural elements, scientific instruments, economic dynamics, political institutions and so forth (Law, & Hassard, 1999). Science and technology, in particular, have the capacity of importing distant connections into local situations and vice versa. Think of the way in which the material architecture of prisons, mental institutions, but also of classrooms, hospitals, cities, etc. forces the interactions that they host to comply with their larger and more general norms of behavior and power distribution. And think of how the evolution of these large technological systems (cf. ENTRY IN THIS ENCYCLOPEDIA), and of the macro-institutions associated with them, is often triggered by the action of single individuals or organizations that, at precise moments in time, start questioning and renewing them.

The study of these actor-networks exceeds the reach of both qualitative and quantitative methods (Latour, 2005). It exceeds qualitative approaches, because the whole point of this inquiry is to show how science and technologies are not confined within their official boundaries (Gieryn, 1983) but spread far away in ways that a situated analysis cannot follow. But it also exceeds quantitative approaches, because the ways in which technoscience bears upon social life are always *ad hoc* and defiant of all forms of standardization. Mixed methods are not a solution either, as ANT's predicament is not to study phenomena that are partially captured by qualitative methods and partially captured by quantitative methods, but to investigate dynamics that elude both.

3. The rise of digital quali-quantitative methods

In their quest for research techniques that were neither qualitative nor quantitative, STS scholars began in the '80 to develop methods to extend the examination of technoscientific practices through the analysis of the written records generated by such practices and meticulously collected by scientists and engineers. Ethnographic observation and archive research had shown that scientific laboratory, patent offices, regulation bureaus and industrial workshops function as inscription apparatuses (cf. ENTRY IN THIS ENCYCLOPEDIA) painstakingly documenting their activities and the connections between them. Following these records offered an opportunity to investigate how the internal workings of technoscience extend like vast, heterogeneous networks spanning through the whole society.

STS researchers focused initially on the most established and standardized scientific records, that is those available in scientific literature. Since the onset of modern science, scholars from all disciplines have invested remarkable resources in the inscription of their work – e.g., through the standardization of authorship and institutional affiliations, the formalization of citations, keywords, abstracts, etc. And since the '60s such records had been collected and distributed as research data thanks to the work of the *Institute for Scientific Information*. It was therefore quite natural for STS scholars to use the data and techniques derived from the field of scientometrics (cf. ENTRY IN THIS ENCYCLOPEDIA) to "map the dynamics of science and technology" (as in the title of the book by Callon, Law & Rip, 1986; see also Wyatt et al., 2016). The idea of "mapping" is crucial here, as standard scientometric protocols tend to rely heavily on aggregation and can be categorized as squarely quantitative. Not the methods used by many STS scholars, however, as for them the objective was never to identify general trends or patterns, but rather to visualize the landscape of scientific literature to highlight authors and ideas situated at interesting crossroads or obligatory passage points (cf. ENTRY IN THIS ENCYCLOPEDIA). Callon, Law and Rip call this approach "qualitative scientometrics" to underline how "tracing the dynamics of science and technology demands the use of quantitative methods, but these are best seen as the pursuit of the qualitative by other means" (Callon, Law & Rip, 1986, pp. 108).

The techniques of scientometrics mapping, however, have major limitations: drawing on strict definitions of what counts as an author, a keyword, a publication, a citation, they are constrained within the limits of scientific literature. Striving to extend their reach, STS scholars thus moved from scientometrics to text analysis and contributed to the development of several pieces of software (e.g., Leximappe, Candide, Calliope, Réseau-Lu, Prospéro) to analyze grey literature documents such as technical reports and press articles (Venturini & Guido, 2012).

The breakthrough, however, came with the advent of digital technologies and their way of generating records allowing to extend the techniques of natural language processing and network analysis devised for the study of scientific texts to an increasing variety of social phenomena. While social datafication did not begin with digital technologies (vast and systematic campaigns of data collection can be found in the administration of ancient Egypt and China, in Renaissance bookkeeping and in 19th-century exploration and colonization logs), the advent of computers has dramatically increased the traceability of collective life. Digital mediation requires social actions to be converted into data, which are formatted, transmitted and stored through a limited number of standardized protocols. This does not mean that data have become any cheaper (as it is often wrongly suggested), but it does mean

that *some* of the costs of social traceability are covered by the efforts to develop and maintain digital infrastructures and that, as a consequence, more and more diverse data become available for social research.

Notably, many of the data made available by digital technologies do not resemble the records collected with either qualitative or quantitative methods. In many ways they are worse – missing both the thickness and sophistication of classic ethnographic observations, and the careful curation of classic statistical datasets. And yet, these new data are sociologically interesting for they open new methodological opportunities and in particular the possibility of dealing with the complexity of collective phenomena other than by the classic tools of situation and aggregation (Boullier, 2015).

In the STS, the first attempt to harness the methodological opportunities of digital technologies sprung (maybe not surprisingly) from actor-network theory and took the name of *digital methods*. Spearheaded by scholars such as Richard Rogers (2013) and Noortje Marres (2017), this approach focuses on digital *media* and proposes to consider them as research tools rather than as research objects. While this distinction is not truly binary (as discussed in the next section), it is no less important to understand the originality of this approach. The purpose of digital methods is not to study new dynamics of online sociality through the classic tools of sociology, but to study the classic objects of sociology through the new methods of digital media. Piggybacking on tools such as search engines, recommendation systems, crawlers, scrapers, visibility metrics and APIs, digital methods repurpose the devices of online platforms and digital marketing into instruments for social research.

It should not come as a surprise that online media have been the first technological field to be methodologically reappropriated by social scientists. After all, the business model of online media and social platforms is largely based on the extraction, analysis and monetization of social information. In the footsteps of opinion research and marketing surveys, online engines and analytics have been introduced to monitor (and monetize) social dynamics, and the step from commercial to academic use was the shortest. In recent years, however, a similar *repurposing* effort has inspired a growing diversity of methodological experiments with digital tools developed outside academia. The same effort to push beyond the qualitative/quantitative divide can be found in research relying on open-data portals, human or environmental sensors, geographical information systems, data visualization techniques, data journalism or activism databases and so on. For some scholars, particularly those working in the Global South (Milan & Treré, 2019) or with citizens groups (Gabrys et al., 2016), this repurposing work has also taken a political flavor and has become a way to oppose the dominant approaches of social datafication in ways that are both STS-inspired and quali-quantitatively oriented.

4. Quali-quantitative methods against big data

"STS-inspired" and "quali-quantitatively oriented" are key features of the non-binary methods described in this entry and they are crucial to set them apart from other forms of computational social science and digital sociology.

Highlighting the STS heritage of non-binary methods is important, because while the use of these methods is not limited to the study of technoscience, their approach is deeply influenced by the intellectual posture of STS, especially in the reflexivity with which they

consider the inner workings of digital technologies. Coming from an STS tradition, these methods cannot share the naïve enthusiasm for digital traceability typical of most other forms of computational social science. Appreciating the fact that all (material and intellectual) technologies have a social life (Law & Ruppert, 2013), STS scholars know all too well that this is also true of their own research techniques. If most sociological methods have been developed, or at least enabled, by actors and forces beyond academia (as exemplified by the history of statistics, geography, economics, polling, ethnography, etc.), the dependence on external research partners is even stronger in the case of repurposed digital devices.

As discussed in the previous section, it is an explicit claim of these approaches that their techniques are not created from scratch, but "recycled" by repurposing existing tools and metrics. Such an approach is extremely effective, as it allows hijacking the computational power of advanced digital infrastructures, but it also comes with the risk of being hijacked by them. Exactly as scholars should not use statistics without considering that most of its techniques have been developed by and for the modern state (Desrosières, 1998), so they should not use digital records or platform metrics without keeping in mind that those records and metrics have been originally developed for other purposes. Without a sufficient injection of reflexivity and critical thinking, the scholarly adoption of the dominant techniques of digital computation can only end up fostering the forms of surveillance capitalism that created them (Zuboff, 2019). Embracing uncritically the forms of social monitoring developed for marketing or policing than amounts to blurring the already blurry boundaries of social sciences.

Unlike other forms of computational social science, non-binary methods are interested not only in exploiting the data generated by digital technology, but also and crucially in understanding the way in which these technologies make collective existence measurable and computable. In this sense, they follow the classic precept of ethnomethodology (world cf. ENTRY IN THIS ENCYCLOPEDIA): to simultaneously use and investigate the native methods used by social groups to make sense of their collective existence. This is why it is not entirely correct to affirm that the methods described in this entry consider digital media as research tools rather than as research objects.

Maintaining a critical perspective on online media and data infrastructures, of course, does not mean writing off their research opportunities. Quite the opposite, it is a classic STS's posture, to see the critique of technologies as a springboard for sociological investigation. A posture that, in the case of methods described in this entry, translates in an effort to understand the sociological affordances of digital technologies in order to push beyond the limits of traditional sociological methods (Blok & Pedersen, 2014). Quali-quantitative scholars embrace digital records and computational techniques with the same enthusiasm as the apostles of big data, social physics, and even digital marketing. Yet, where most other approaches tend to praise digital traceability for its muscles (i.e., the way in which it increases the volume, granularity and velocity of data collection), digital methods are more interested in the ways in which the actors that inhabit this traceability invent new and surprising ways of making sense of the social world.

The revolution of digital methods is truly quali-quantitative. It is not a question of "more" (more data, more calculation, more quantification…), not even of "better" (more precise records, more individualized collection, closer monitoring…) but a question of "new". It lies in the ability to generate new traces, new analytical combinations, new exploration and

visualization tools. For too long, social inquiry has been bogged down in a quali/quanti opposition which, despite its pragmatic value and historical rationale, risks anesthetizing our methodological creativity. Learning from the ways in which actors use new technologies to appraise their social worlds, while keeping a critical eye on their own bias and asymmetries, non-binary methods can rekindle our sociological imagination.

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