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**Big Data in the Spotlight:  
echoes of an uncertain  
transition**

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## **Abstract**

Social science research is increasingly permeated by the use of big data in the construction of objects of study and their resulting theoretical-methodological approach. Now then, what senses are involved when addressing large amounts of data and what is their impact in the design of a new research project? This article proposes an answer to such questions by explaining the main problems in relation to social science research on objects of study that entail the use of big data. In addition, some considerations are shared with respect to the updated discussions on objectivity and truth which come into play with the use of said materials, with emphasis on aspects that are considered inescapable, such as those associated with the very generation of such data. Finally, the main dilemmas derived from said materials' safekeeping and retention are presented, implying new decisions in relation to the management of digital files.

## **Keywords**

Big data, social sciences, research, file, discourse

## 1. Introduction

Utopias, desires and realities around big data and their use in social sciences have occupied much space in both academic and journalistic considerations. The assumption that all data on the Internet, as a result of its purported easy and free access, is available for everyone who is interested in its compilation and approach must, at the very least, be placed in the spotlight. Just as the arrival of the Internet brought about new concerns and modified the modes of approaching our objects of study, social sciences are still going through a stage in which caution in the use of macrodata<sup>1</sup> should be the rule, rather than the exception. If we consider, along with Verón (2013), that the importance of WWW does not lie in the last W ('web') but in the first two ('world wide'), it may then be understood that "the emergent element is then the scope, the field of application, rather than the concept" (p. 278, authors' translation). Thus if a revolution in the access unfolds, we should ask ourselves: access to what and access by whom?

This article aims to account for the main insights into the epistemological and methodological problems that stem from the approach to objects of study entailing the use of big data.

This exploration shall involve questioning the assumption that all current social research, in order to be considered relevant, must *necessarily* work with large amounts of data, whether to describe, explain or predict a certain phenomenon. On the other hand, and for research projects that effectively require big data for their conduct, we shall recover the theoretical advances on the area, to account for certain problems associated with these works. Veracity, objectivity, neutrality, representativeness and ethical dilemmas (Meneses Rocha 2018) are presented as axes to explore.

Quandaries in relation to the qualitative and quantitative aspect reappear when accounting for these problems, in what not only seems to be an update of such discussion but also the manifestation of the very

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1. The term "macrodata" shall be used as a synonym of "big data".

power of truth attributed to the amount of data. Actually, the “scientific common sense”, if we may say, seems to assume that these data –which are *per se* neutral–, guarantee great success in research, leaving incapable aspects aside: the actual generation of data, the relations established between one another, the context in which they are produced, among other variables.

Finally, keeping such a huge amount of digital material, specially that which is pulled out from social media sites on the Internet, leads to the configuration of a new archive form that deserves to be studied. Is it a mere aggregation of confusing information or, on the contrary, a collection of materials that require the deployment of particular strategies and operations of accessibility and safekeeping? Are we thus living an era in which metadata are configured as its new archive and therefore constitute a legacy to future generations? We shall delve into these questions throughout this article.

## 2. Big data, senses and associated problems

We shall begin by explaining what we mean when we talk about big data. A possible path to move toward this question is determined by the definition of “data” itself. Puschmann & Burguess (2014a) carried out an interesting exploration of the various senses of this term in order to understand how it emerges, and a certain notion of big data gets stabilized. In the first place, “data” refers to “something given” (in Spanish, *‘algo dado’*). With the advent of the 40’s, this meaning is supplemented with the advance in digitalization and employed to describe any kind of information used and stored in the computing environment. In contrast with the term “data”, which emerged essentially linked to the field of math and theology, big data develops in its early days in the sphere of business. The new technical infrastructure and the capacity of interrogating large volumes of data in order to make predictions characterized the 60’s: “Big data marked a suggested shift from relational database management systems to platforms that offered long-term performance advantages over traditional solutions” (Puschmann & Burguess, 2014a,

p. 1694). This idea of prediction still flies over scientific discourse, in a sort of utopian longing. As Diviani (2018) suggests, this longing “is based on one of the basic aspects of the technical device that arouses great fascination: the alleged faculty of predicting future phenomena. However, is it possible to predict social and human phenomena?” (p. 14, authors’ translation).

A very different case is, for instance, that of those studies which, from the use of big data and driven in real time, mark the evolution of a phenomenon like the worldwide spread of COVID-19<sup>2</sup>, carried out by Johns Hopkins Center for Systems Science and Engineering. The map was publicly shared by mid-January 2020, and developed with the purpose of providing investigators, journalists, government agencies, and citizens in general a reliable and up-to-date data source in real time at world level. All data have been made available free of charge through a GitHub repository, and its code can be accessed for shared use on different platforms. The map is both automatically and manually updated and verified with official reports disclosed by the health authority of every country.

The change is far from minor: phenomena that seemed to be immeasurable so far begin to unfold at least as possible objects of study. It is clear that the use of big data as a methodology of analysis is necessary and useful insofar as it is in line with the research questions and objectives that guide a certain study. In any case, as Diviani (2018) posits,

*...what should be evaluated, actually, are two ideas that accompany grandiloquent and enthusiastic assertions, which are closer to marketing than to the scientific field: the idea of the Big, which is a positive value by itself, and the piece of data is a portion of the neutral and objective ‘reality’ (Diviani 2018: 20/21, authors’ translation).*

We shall come back to the idea of neutrality and objectivity later in this document.

In this sense, several authors agree on characterizing big data based on “3 Vs”: volume, velocity and variety. Tascón (2013) suggests, on his part, a fourth V: visualization, as an important part in connection to big data is

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2. <https://coronavirus.jhu.edu/map.html> (last visit: March 13, 2020)

related to the way in which such data can be seen. Besides, Sosa Escudero (2019) contributes with a fourth one: veracity, “a term that refers to the fact that the noisy and spontaneous nature of big data pieces of data is in contrast with that of traditional survey or bureaucratic data, usually subject to strict validation exercises” (p. 32, authors’ translation). That said, limiting ourselves to the specific sphere of social sciences, at least two data typologies may be distinguished: on the one hand, as shown by Manovich (2012), *surface data* and *deep data*; on the other hand, various authors (Boyd and Crawford, 2012, Kitchin & Lauriault, 2015; Meneses Rocha, 2018) also differentiate between *big data* and *small data*.

In the first case, data are linked to different spheres of knowledge. Surface data is associated with quantitative methodologies that allow for data access over many; whereas deep data is closely related to qualitative methodologies that have made it possible to get to know particular problems but with a higher degree of specificity. As regards the second distinction, the *small data* capture “occurs in a controlled manner and responds to a deliberate statistical and conceptual design” (Meneses Rocha 2018: 422). The “three Vs” exhibit vast differences in both cases. In *small data*, volume and variety are limited, and velocity is slow. In the case of *big data*, on the contrary, volume is practically unlimited, velocity is high and constant, and variety is wide.

Just as we highlighted the importance of the possibility of accessing a large amount of data for both sciences in general and social sciences in particular, we should also observe the economic and political value these huge amounts of data have. It is clear that this is due to the fact that data –unlike those obtained from completing a survey– are “anarchic and spontaneous” (Sosa Escudero 2019: 31). Turning the cellphone GPS on in order to get to a certain location, taking a photo with geolocation or opening an *app* inevitably generates a set of data that were originally produced with the only purpose of getting somewhere on time or taking a picture of something interesting. In connection with this, problems and disputes over data privacy arise. Data mostly belong to technology companies –most of them located in the United States: Google, Facebook, Amazon, Apple and Microsoft– and their obtainment for the purpose of

knowledge production becomes a difficult task, if not impossible<sup>3</sup>. Regarding privacy, the Cambridge Analytica scandal that became known in 2018 unveiled the arguable ploys for data use with political purposes, with no user consent. In addition, it should be noted that logging into any social network requires the acceptance of a set of terms and conditions that, either due to their extension or technicality –almost obscurantist–, very few users are able to understand. Thus, data “are not pulled out from us automatically, but through social relations to which at some point, though retrospectively, we have supposedly consented” (Mejías & Couldry 2019: 89, authors’ translation). In this sense, a sort of mousetrap is generated: the acceptance of such terms and conditions becomes the necessary condition for platform access.

After this brief overview, we may define big data following boyd and Crawford (2012) as a cultural, technological and academic phenomenon, based on the interaction of:

*(1) Technology: maximizing computation power and algorithmic accuracy to gather, analyze, link, and compare large data sets. (2) Analysis: drawing on large data sets to identify patterns in order to make economic, social, technical, and legal claims. (3) Mythology: the widespread belief that large data sets offer a higher form of intelligence and knowledge that can generate insights that were previously impossible, with the aura of truth, objectivity, and accuracy (boyd and Crawford 2012: 663).*

A technological, analytical and mythological aspect is deduced from the *supra* definition given, which would generate, as the authors express, an aura of truth, objectivity and precision. This is, above all, what seems to revive the discussion about quantitative and qualitative approaches; or what may be named, after specialized literature on the matter, a new form of empiricism: the pre-eminence of data over theory. This kind of “return” to data puts a double strain: on the one hand, on the type of data collected; on the other hand, on the way they are interpreted. We

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3. Twitter has recently announced changes in its data access policy regarding public conversations for investigators. Please see [https://blog.twitter.com/es\\_la/topics/product/2021/haciendo-posible-futura-investigacion-academica-twitter-api.html](https://blog.twitter.com/es_la/topics/product/2021/haciendo-posible-futura-investigacion-academica-twitter-api.html) (visit date: February 02, 2021)

agree that, as Tagnin (2019) states, the questions posed in social sciences after the arrival of big data “revive historical debates on the criteria used to explain the domains of legitimate objects in scientific discourse” (n/p, authors’ translation). The actual possibility of relying on substantial amounts of data, replicating relations at various levels, could be understood as a new stage in which resorting to them makes it possible to find *evidence* of social life<sup>4</sup>.

Now, we shall focus on the senses associated with big data. As we have already said, data seem to exhibit, *per se*, a significant share of truth, objectivity and neutrality. At first, it is necessary to take into account that every piece of data is not equivalent to an extracted portion, with no mediation, of reality. On the contrary, data used to conduct scientific research are social constructs, representations of certain phenomena that “do not exist outside of ideas, instruments, practices and the context framing their creation and interpretation” (Meneses Rocha 2018: 424, authors’ translation). The investigators’ critical and thoughtful view is still as necessary as the data nourishing works. Besides, another crucial aspect is related to the representativeness of the extracted data based on the phenomenon under analysis, the research questions and the objectives of each study. As stated in a previous work (Gindin and Busso 2018), the warning about this representativeness results “not only from the enormous amounts of information which are potentially unmanageable based on qualitative analysis, but also from dealing with an ever-expanding data universe whose frontiers are unknown” (p. 32, authors’ translation). Hence, the convenient question posed by Cingolani and Fernández (2018): “which criterion should be applied to build representativeness if we do not know where the universe hits bottom?” (p. 160, authors’ translation). For instance, in the case of Twitter, Gaffney & Puschmann (2014) warn about under- or overvaluing the extracted data from accounts on this social network with respect to the general population. This is, how representative are Twitter users in relation to the society as a whole? And, apart from that, if we formulate hypotheses in relation to the population of Twitter users, how shall we measure users

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4. For instance, sociology and the use of surveys to explain certain types of social behavior.

who only post a tweet occasionally with respect to those who do it all the time?

Within this frame of big data-associated senses, Puschamn & Burgues (2014a) analyze two metaphors used in the press<sup>5</sup> which enable us to consider the effects of a set of socially-circulating ideas. The first suggests that big data should be understood as a *natural force that should be under control*: a homogeneous mass where essential, valuable, hard-to-control and ubiquitous data coexist. Besides, the link with water implies attaching a neutral value: water is insipid and colorless. Now, the possibility of drowning in such data torrent is also an imminent and constant danger. The second metaphor presents big data as a *food or fuel to be consumed*, and in this regard authors point out two possible paths. On the one hand, the idea that big data is an indispensable fuel for survival; on the other hand –and on the opposite side of the same coin– big data appears as a fuel that feeds companies, for example. As authors assert, “both food and fuel must be consumed to exist and to move forward rather than being consciously used” (p. 1700).

The arrival and consolidation of big data has also led to the shaping of new disciplinary fields, such as digital humanities, computer social sciences and data sciences<sup>6</sup>, among others, in some way blurring disciplinary boundaries. Therefore, we can easily see the need for some imbrication between “traditional” approaches and knowledge linked to computer sciences; an imbrication that also expects social scientists to “understand realistically and critically the transformation of data into useful knowledge for society” (Meneses Rocha 2018: 416, authors’ translation). Machine learning methods, located in the frontier between statistics and computer studies, seem to tackle –at least for now– the challenge of

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5. Examples have been taken from *The Wall Street Journal*, *Forbes*, and *Business Insider*, *Wired* and *Computerworld*, *The Chronicle Herald*, *USA Today*, *World Future Society*, and *Booz & Company*.

6. For the specific case of Twitter, we suggest reading Gaffney & Puschmann (2014), who describe the various tools which are currently available to collect data, showing their capacities and their limitations. In order to learn other techniques used that are not necessarily related to Twitter, we recommend reading Arcila-Calderón, Barbosa-Caro and Cabezuelo-Lorenzo (2016).

handling these data volumes: a computer process is supposed to learn automatically, on the basis of any predefined criterion. To an increasing extent, an inter-disciplinary approach is becoming a mandatory passage point for the conduct of serious works which do not disregard the limitations that have been pointed out along these pages.

### 3. Memory and archive in the era of Big Data

The presence of big data, both as work input and as a theoretical-methodological dilemma, confronts social analysts with the problems mentioned above, but not just that. Apart from the questions associated with building analysis corpora and the expertise needed to manage them, the existence of large volumes of information on tastes, consumptions, opinions, commutes, from considerable numbers of persons, make it imperative to reflect on the *temporality* of such contents; or rather, on how they make up an *archive*, in the sense of an activity log of Internet users.

As mentioned above (Gindin y Busso 2018), social scientists who decide to undertake research by using big data are forced to solve delicate issues regarding their access, as well as their gathering and systematization processes. Such operations also impose the acknowledgment of a particular temporal dimension update: not just because of involving content which is inevitably produced in the more or less recent past, or more or less remote past, but also because this access entails certain omissions, gaps or *oversights*.

It is not a case of selective lack of memory, but a technical impossibility: even though there is a sort of extended certainty that it is possible to access every material present on the Internet, in practice many times it is impossible to retrieve the material produced thoroughly. By way of example, the case of Twitter can be mentioned, in which the platform itself, even though enabling the collection of tweets posted there, only allows access to part of them<sup>7</sup>.

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7. As Gaffney & Puschmann (2014) point out, one of the greatest difficulties in studies

Certainly, the material collected –including its omissions– is still substantial, even immeasurable. But the recognition of these discontinuities enables us to emphasize the complexities of a role that, maybe involuntarily but compulsorily, must be taken on by those who use this kind of materials: a kind of new archivist, a person who is co-responsible for managing the *memory* of digital spaces.

We understand the archive as a construct created by the investigator, showing specific arrangement logics and safekeeping mechanisms: both define the need for a precise reading order, which is closely related to the space and the time in which it is brought into play. Thus, the archive “is neither the reflection of the event nor its proof or evidence. It must always be worked on by constantly cutting and mounting it with other files” (Didi-Huberman 2007: 7, authors’ translation). What is challenged here with these assertions is that the presence of large amounts of data, which are often capable of providing hyper-detailed and thorough information about actions and behaviors, does not necessarily imply an exhaustive reservoir of *everything* that happens.

In fact, what is preserved and protected results from different operations: some are more automatic, involving data retrieval, and others are rather intentional, such as the decision on what to retrieve and then what should be kept. In an increasingly mediatized society (Verón 2013), in which the pace of social life is directly related with media presence –as well as its associated technologies–, the recognition of that archival activity is not banal, as it implies making intelligible those huge amounts of preserved information (Freire 2009), where multiple negligible and everyday voices displayed in different Internet spaces also emerge, and may thus get a precarious guarantee of protection... or at least that is entailed.

As a matter of fact, in mediatized societies just as we have known them so far, it has mainly been ‘traditional’ mass media that have been descri-

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based on data from Twitter results from the technical infrastructure of the platform itself. There is currently no way to know how thorough is the retrieval of a data set based on what has been originally posted: “without firehose access, researchers rely entirely on Twitter to provide a representative sample of what is there” (p. 65)

bed as vehicles of the human experience memory, suggesting recollections and interpretations of a shared past which involves the individual memory (Lavabre 2007). It is a *memory culture* (Huyssen 2002), whose other side is great fear of oblivion and amnesia (Guasch 2005). Nowadays, however, we may venture that it is big data that has been considered the depository of that memory, though mixing up the mere storage of information and the accessibility and synthesis activities it requires, and making omissions and discontinuities invisible in the information as accounted for earlier.

With these safeguards in place, we may state that big data is in effect a powerful scope of archive for contemporary memory, allowing us to preserve an amount of information with a degree of thoroughness which was inconceivable until recently. However, acknowledging this does not mean closing other safekeeping spheres where the voices of those who do not participate in the digital exchange show up; it is true that this number is becoming increasingly smaller, but it is still consistent: if we take the data retrieved from the Internet as an example, we discover that by January 2021, 59.5% of the global population was online<sup>8</sup>. Along with this, the nuances, the contextual and sense-related resending, as well as certain dialogues involving several significant materialities, which cannot be retrieved in that huge data memory.

In addition, as it has been anticipated earlier, the presence of this large amount of data and its storage does not imply that adequate safekeeping and intelligibility policies are in place. Firstly, the substantial character of the stored information requires large physical spaces (the so-called *data centers*) to keep servers and hard disks for data storage, in an *in crescendo* fashion that requires increasingly new material capacities<sup>9</sup>. Secondly, and retaking Foucault's concept of *archeology*, we can understand that there exist specific practices around big data that give them an order, an

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8. Source: *Digital 2021*. 'We Are Social' Annual Report, available on <https://wearesocial.com/digital-2021> (last visit: February 2, 2021).

9. For instance, see <https://www.ibm.com/blogs/systems/donde-esta-el-almacenamiento-de-datos-con-big-data/> and <https://fractaliasystems.com/2016/08/03/big-data-donde-se-almacena/> (last visit: March 20, 2020)

organization, an internal distribution: “splitting it up in levels, establishing series, distinguishing what is relevant from what is not, pointing out elements, defining units, describing relations and producing discourses” (Guasch 2005: 160, authors’ translation). That part of the archive that is made visible and apprehensible is then the result of operations which, in terms of social research, are linked to the definition of an object of study, the work hypotheses in relation to them, and the systematization and analysis techniques put into play. That is to say, a voluntary and even systematic operation is needed to *make* such great amount of available information *say* something.

Probably, at this point, we can state that with big data we are facing a new change in the forms of recognition and interpretation of the world. We believe that it not only involves outlining the construction of sensitive experiences in relation to that *being with others*, but also defining which topics are worthy of attention, becoming an exceptional instrument of knowledge about this common being. Ultimately, by paraphrasing Sorlin (2004), we may say that these dilemmas will shape the debate on what characterizes modern society, by preserving or leaving out *data* about it, which shall be accessed by future generations.

#### 4. Conclusions

To give this last section of the work the name “conclusions”, based on the foregoing, is indeed a contradiction. The possible scenarios that open up around the use of big data are, to say the least, vast, and branch out in various spheres. Social sciences, economy, politics, sociology and communication sciences, among others, are probably witnessing a deep and irreversible change with respect to the very definition of their objects of study and the methodological strategies designed for such purpose.

However, and to sum up, we know that big data (and their corresponding *small data*, *deep data*, etc.) is not a mere neutral aggregate of available information for everyone, but rather a complex cultural, technological and academic phenomenon which requires the investigator taking clear epistemological positions, and not just that. Although it is true that many national states and governments consider it as an increasingly vital in-

put when it comes to weighing public policies, and that even political representation mechanisms –for that matter– seem to be modified by the possibility of collecting and using large amounts of data in relation to the most insignificant behaviors of citizens, an open-eyed reflection is also crucial here.

In this sense, the enthusiasm for what is understood as a great opportunity to learn about citizens' behaviors and values, based on the tracks left on different digital spaces where they participate, is clearly noteworthy. Besides, these tracks social media users, for example, leave on their way quickly become an object of consumption; data are sold and purchased giving shape to a business ecosystem (Puschmann & Burguess 2014b). This –true– possibility should not hide its opaque character to some extent: as mentioned above, neither do data speak for themselves nor are they unconnected to research or politics' interests; and going further, data do not even have the power to account for the whole social world.

What is left out, either due to the temporal ellipses of the gathering activity itself or because they are activities with no track on the digital world, should also be understood as part of the discursiveness of an era, even though it is not taken into consideration when discussing macrodata and related items. Metaphors used to refer to big data (like the one which presents it as a force of nature and the other which compares it with a fuel to be consumed) enable us to think about the nuances of that concept, in spite of their failure to encompass precisely what falls outside of them.

To reflect on the social scientist's task in this context requires us not to elude these disputes. It may probably be an exaggeration to say that we are facing a major change of era just because of the presence of big data, but we are certainly able to assert that its implications constitute a point of no return in the scopes intended for science... and for the political task associated with it. Examples are numerous, such as the possibility of predicting the route of virus spread (as it has been explored to tackle the COVID-19 pandemic) based on the macrodata collected on population commuting and contact between persons; or the proposal to recognize the social (bad) mood in the face of a given public-interest argument.

However, we should not forget that not *everyone* can make such predictions and not *everything* is included there. Again, the availability of such data is not the only required condition: technical and cognitive skills are also critical to apply them, and the material and economic availability might as well be necessary for the purpose.

There is no doubt that big data will not be the only one telling about us in the future, but also these discussions, acting as echos of a scenario in uncertain transformation ■

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