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The Digital Traces' Diamond. A Proposal to Put Together a Quantitative Approach, Interpretive Methods, and Computational Tools

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Abstract

The paper aims to suggest a simple model for the interpretation of digital traces as a source of data in Social Science research. Digital traces are very interesting because in the sociological tradition there is no extensive use of traces: the great part of sociological methods prefer direct and indirect strategies of data collections. But today digital traces are important because the technological environment of the Digital Society produces a great number of digital traces that are an important source of data. While in sociology there is a little debate in the use of traces, in the Social Sciences and humanities there are several traditions in the interpretation of trace, and we focus our attention on the most interesting: the ethnomethodology, the school of suspicion, the interpretive anthropology, the evidential paradigm. What these traditions have in common is their interest in abductive reasoning or the way to use partial information to build probabilistic knowledge, a typical strategy of hunters, detectives, and physicians, archetypes of the social theory of traces. Then we propose a model for the interpretation of digital traces that is inspired by the cultural diamond of Wendy Griswold and for this reason we call it the digital traces' diamond. Then we use a series of case study to describe how the proposed model works and how can be useful for the use of digital traces as a source of data.

Keywords: digital sociology, digital traces, cultural diamond.

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1. The digital traces: characteristics and definitions

Digital traces are an interesting concept to apply in sociological research for two reasons. Firstly, because traditional sociological research does not use extensively the traces as sources of data. The use of traces for the identifying of an individual or collective behavior is used in different Social Sciences methods as psychology, anthropology, criminology, and so on, but not in sociology. This is because sociological methods prefer to collect information directly from the social subject (opinions, behaviors) or indirectly from his social actions (interactions, consumptions), while other research traditions have to collect data in a very indirect way, for example in cultural anthropology where the researcher has to decode the behavior of the community with the use of observant participation. This is the main reason because in sociological research there is an important tradition in the use of surveys (questionnaires with sample) and interviews (life history method, focus groups, and so on) but very little in the use of traces. The second reason for the interest in digital traces is the structure of modern society. The main element of contemporary society is the social processes embedded in a digital environment. Social media, Internet services, apps, smartphone, create an environment in which the social and the technological side are deeply interwoven. There is an interesting debate in defining contemporary society: network society (Castells, 1996), connective society (Rainie, Wellman, 2012) Digital Society (Lupton, 2012; Marres, 2017), platform society (van Dijck et al., 2018), but all arguments can be lead back to one single question: which are the features of the modern society where the technology is a structuring element of the society? Besides the theoretical consequences of this question, there is an important one affecting the social research: people leave traces when they interact in digital environments. These digital traces are very different: log records, cookies, GPS data, metadata, but is possible to use them for an individual or collective behavior analysis because they are produced by the use of the platforms from the people.

The main problem we have to deal with is to define what digital traces can be. We want to suggest a definition that best fits the proposal we describe in the next pages, so our digital traces description can be considered as an operational definition, a definition we use for our argument and we are aware it can be improved in several different ways. If we focus our attention on the amount of Social Science research paper using something we can consider as digital traces, we can see different terms: data traces, digital footprint, tracking element. In this variety of expressions, we can identify some permanent concepts of the idea of digital traces. First the presence of a sign (in the semiotic sense), that is an element – usually a digital one – that testify to an ongoing or occurred process whose metadata can be useful for understanding the

technological event and the social event which have produced it. For example, the cookie is a small piece of data stored in the browser used by the websites to remember information of the browsing behavior. It is used for the correct functioning of the website, but it is clear that if we collect cookies we can infer some information about the user of the browser. The second element is looking at the digital trace as data. Data is a concept that exists either in the sociological tradition or in the computer science one, but it is used in a very different way. What these traditions share in the use of the concept of data is the necessity of interpretation: a data interpreted can be considered information. The ontological relationship between data and information is too complex to face here: there is a long tradition in approaching this problem. What we want to remark here is that data does not speak for itself: data is just something that needs a context – theory, a technology, a model – to make sense.

The presence of a digital sign that can be interpreted as data: this is the raw idea underlying the different terms used for digital traces. Now we can propose our operational definition: the digital trace is a technological process embedded in a form. Technological process because we need a technology that produces the digital trace: without a digital environment we cannot have a digital trace. Embedded in a form because the digital trace needs a way to hold together all the elements of the trace. The analogy we are using as a guideline of our argument is the use of animal tracks by the hunters. A hunter uses physical track – footprint, bite marks, remains of food – to understand some characteristics of the prey. In social research, we can use digital traces to understand some characteristics of the underlying social behavior. The problem is the needing a reference model to make digital traces meaningful. For example, there is a difference between trace and tracks. To trace is a verb describing the strategy to going backward from the origin of the process, to track describes the process of move forward for the forecasting of the process. In other words, from a trace, we can identify the past, from a track we can try to figure out the future. This is the main reason because we have suggested that traces are used to identify processes ongoing or occurred. If you read carefully the suggested definition, is possible the recognize our source of inspiration: is the definition of the cultural object according to Wendy Griswold (2013: 11). We think that this definition is a good starting point because we consider the digital trace as a cultural object. In fact, like the cultural object, the digital trace needs a shared significance embodied in a form. The cultural object is a shared significance referencing to a community, the form is the tangible way for recognizing the sense and in its whole, the cultural object tells a story about itself and about the community it refers to. Similarly, the digital trace is a shared significance referencing to a community, the people who produce the trace, and the digital

trace tells a story about itself – its production – and about the community, it refers to.

Considering a digital trace as a cultural object have many consequences, here we can list just some. The first one is its complex structure. Merging technology, digital environment, social productions, the digital trace is composed of different layers and we have to deconstruct them if we want to make it meaningful. In this case, the digital trace as a cultural object needs an interpretative strategy for the correct understanding of the layers and the correct definition of the relationship between the layers. The second one is the digital trace as a cultural object that belongs to two different communities: the techies and the users. The techies or the technological community are the people responsible for the creation of the form, namely programmers, designers, system developers, and so on. They are the people who decide – for example – what is a cookie, which is its role and how the system has to handle it. The user or the producer community is the people who create digital traces by unintentionally using the technological platform. This is the side that makes the digital traces useful in Social Science research. Direct consequences of that are the third consequence: some characteristics of the digital traces are mandatory, which means they are bonds which the researcher has to know in order to make a correct interpretation of the process they refer to. The technology side of the digital traces is constraints, while the production side of the traces are individually and socially defined and they are the part we need for a sociological interpretation.

2. The different traditions for the use of traces as a source of data

Hunter, detective, physician. They are the archetypes of the social theory of traces. Most of the metaphors used to describe the use of the traces as a source of data and information take place from this kind of occupations. This is for three reasons. The first one is a historic reason: they are the first social subjects who use traces for attending a social role: feeding the community, identify the guilty, heal the sick. The second is an epistemological reason. The scientific revolution established the scientific method as a technique to construct general knowledge collecting a great number of particular information. A proof of this strategy is the mathematization of the scientific disciplines since the XVI century and the use of the experiment as a way to collect data reproducing the same situations (controlling the correct variables). But there are other fields of knowledge by which the analysis of the single case is important, and they are scientific disciplines based on case study: psychology, medicine, psychiatry, geology, astrophysics, and so on. There is a wide debate

about the correct use of data in science: the main two reasoning strategy is deduction – from the general to the particular – induction – from the particular to the general. But there is another strategy, abduction, from partial information to a probable general scenario: the reasoning strategy used – for example – by the doctors to recognize an illness. The third is a literary reason: the methods used to understanding traces is usually compared to the reading. Decipher the footprint, looking the evidence, recognize the symptoms, they are similar to reading because they are interpretation strategy. Making traces meaningful need a method for the interpretation of the signs, and reading is the best analogy we can use to accomplish it.

In Social Science and humanities, many traditions are dealing with the use of traces as a source of data, we will describe the traditions we think the best fit with the problem of digital traces.

One important tradition is ethnomethodology by Harold Garfinkel (1967). The ethnomethodology is a sociological tradition that puts together the importance of the definition of a situation by the people involved in it and the use of the phenomenology approach to analyze the structure of the social experience of the individual. There are two main points of this approach: the concept of indexicality, and the concept of reflexivity. Indexicality is the sum of the elements as gestures, cues, word used in context for the social interaction of the individuals which have sense only in if connected to the context they belong to. For example, person A is in a hurry and he is asking person B "Do you know what time is it?", the socially correct answer is "It is eleven o'clock". Person B has decoded the situation in this way: "This man is in a hurry and by asking me what time is it he wants to know the time of the day right now so he can understand if he is in late or not". In the simple answer from person B, he has recognized the situation and answer according to the social world took for granted. If the conversation were: "Do you know what time is it?" "Yes, I have a clock", is correct from a semantic point of view, but from a social interaction point of view is wrong. Directly connected with the indexicality, is the concept of reflexivity. Reflexivity is the interpretation of the situation as a particular case of a general condition that exists just as a sum of a particular case in circular reasoning. For example, a jury has to decide if a person is guilty during a trial, and to do so they try to understand in which way an innocent would behave in the same situation, but assuming this, they consider that an innocent has to behave in a certain way, like other innocent in the same situation, and so on in an endless *reductio ad infinitum*. According to Harold Garfinkel, the ethnomethodology is the study of the way people use some strategies (methods) to make the world of social interaction meaningful in a particular context (ethno) and the practical side of common reasoning. Ethnomethodology uses a complex interpretation strategy of the use of words, talks, gestures, and other

elements used by people to make the social world a recognizable context. To do so all the cues of the social interaction are seen as traces of the social construction of the social reality. It is no coincidence the ethnomethodology is focused on situation as jury, hospital and another social context in which the interpretation of the situation is crucial.

Another important tradition is the school of suspicion, a definition of Paul Ricoeur (1965) used to describe the philosophy of Fredrich Nietzsche, Karl Marx, and Sigmund Freud. According to this interpretation, the three thinkers are very important because the starting point of their philosophy is considering the reality as hidden by some prejudice: Christian ethics (Nietzsche), power of capital (Marx), and the censorship of the sex urge (Freud). We can understand our condition only if we begin to unveil the reality under the taken for the granted world. Nietzsche considers Christian morality as a kind of victory of the values of the weak against the values of the strong. Marx assumed that our social world is based on an economic structure and all the other things – religion, culture, society – are just a superstructure. Freud focuses his attention on dreams as a way to access the unconscious activity of the mind. Every one of this thinker uses a particular aspect of our reality as a trace of something underlying that have to be unveiled for the understanding of the society. These traces – morality, economy, dreams – need a context of interpretation to understand in which way the society creates a cage impossible to recognize using traditional stance.

Interpretive anthropology (Geertz 1973) is the Social Science tradition that creates the best framework for the correct interpretation of the traces. The interpretive theory of culture used in this tradition considers the culture as a text in the semiotic sense of the terms. Culture as a text can be described in this way: when an anthropologist uses the ethnographic method to understand a foreign culture, he has to decode all the signs embedded in that culture and has to recognize which are the meaningful signs of the culture he is analyzing. The element of the culture subjected to analysis is a way to access the culture as a whole. In other terms, the culture is a semiotic system and every element of the system can be an access point for the correct understanding of the culture. According to Clifford Geertz, doing ethnography is like reading a manuscript in which the main elements are structured behaviors (Geertz, 1973). The key concept of the ethnographic method is the thick description, a concept Geertz takes from Gilbert Ryle. This term indicates that the description used in an ethnographic account has to decode the stratified hierarchy of meaningful structures in terms of which are produced, perceived, and interpreted (Geertz, 1973). Geertz uses the same example of Gilbert Ryle to describe how thick description works: the three boys winking. Consider two boys winking, the first one is making and involuntary gesture, the second one a conspirational signal

to a friend, and the third one is parodying the first boy wink, laughing at him: the thick description is the correct interpretation of the three kinds of winks, the relationship between them and the social code used to make the second and the third wink meaningful (Geertz, 1973). As we can see, the thick description is a way to decode social actions with the correct understanding of social situations.

The last tradition we want to use is the evidential paradigm of Carlo Ginzburg (1989) which takes place from the debate in art history about the methods of artwork's attribution. The evidential paradigm is looking for cues that are useful to identify correctly the artist of an artwork. Ginzburg finds the original path of this tradition in different fields of knowledge. The first for importance is the art history and its attribution methods of the XIX century. The second is the art of hunting and the technique used to identify a pray. The third one is the divinatory art coming from polytheistic religion and its use of the entrails of an animal to see the future. The fourth one is philology and its strategy to criticize writings and printing press products. The last one is the iconology and its methods for the dating of a painting. What these fields share in commons in the use of the abduction as reason strategy: using some elements to define in a probabilistic way the character of the object or the situation under analysis. The cues act as spies of something else that the expert has to decode. The essay of Carlo Ginzburg full of reference to the medical semiotics, to Sigmund Freud, and Sherlock Holmes, and it is not a coincidence.

The ethnomethodology, the school of suspicion, the interpretive anthropology, and the evidential paradigm: these traditions have in commons some characteristics. Firstly the use of case studies: they try to create knowledge from a particular situation and not from a great number of data. Secondly the situated knowledge: the case study is important not because of its generalization but because of its peculiarity. Thirdly the interpretive stance: the expert has to use an interpretation framework to make the situation meaningful. Fourthly the abductive reasoning: there is a probabilistic bond between the data collected and results achieved.

These characteristics are very useful when we begin to analyze digital traces because the technological and the social elements of the traces need to a model to put the right understanding in the right places.

3. A simple model for the interpretation: the digital traces' diamond

Our previous argument points out the tradition in Social Science and humanities we see more useful to create a framework to understand correctly the traces – in general – and the digital traces – in particular. The path we have

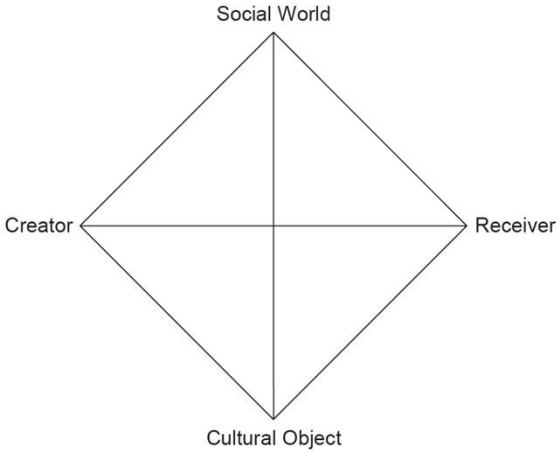
described is not complete and this is not the aim of the paper. We just want to focus our attention on the problems connected to the use of digital traces for a research project and how to handle it. This goal was clear from the operational definitions of what a digital trace is, and now we want to go further in the same argument, continuing our analogy between digital trace as a complex structure and the cultural object.

An interesting proposal for the analysis of the cultural object is the cultural diamond model by Wendy Griswold (2013). The cultural diamond is an accounting device used for the interpretation of the cultural object. It is composed of four elements, everyone with a specific role in the interpretation of the cultural object, and every element is linked to the other one, not for theoretical reasons but interpretation necessity. The name diamond comes from the graphical representation of the model (Figure 1): it is the geometrical figure of the rhombus, the same shape of the baseball field called a diamond. The cultural object is a shared significance embodied in form, so said everything can be a cultural object an idea, a process, an artifact, its main characteristics have to be meaningful for a group of people (community or society). The social world is the symbolic place where the cultural object is anchored to and referred to: it consists of the economic, political, social, and cultural patterns occurring in time. The cultural creators (or creators) are the organizations and systems that produce and distribute the cultural object: they can be single – for example an author of a novel – or multiple – for example the people involved in the making of a movie. The cultural receivers (or receivers) are the people who experience the cultural object and the culture it is related to, they are active meaning-makers, involved in the interpretation of the cultural object. Now we can make some observations for our purposes. The cultural diamond does not work as a theory, but a framework to decode the cultural object: its elements are important but a more detailed model could use more elements, however, we agree with the idea that the elements used here are sufficient for an initial interpretation of the cultural object. The concept of the social world is too broad: clan, families, communities, society, world-class society are sociological objects very different and with very different sociological properties, but if we consider the term working as schematization, we can use it without a problem. The concept of creators and receivers is too vague: they can be very different – for example a movie and its audience – or very overlapped – for example, the prosumer, people creating a cultural object for the self-consumption like family videos. We need differentiation between who creates the cultural object and who uses – also in a symbolic sense – the cultural object, and for our aims they are sufficient.

The digital traces' diamond is directly based on the cultural diamond model, essentially for two reasons. The first one is its simpleness: we need a

framework for the interpretation of the digital traces without forgetting the traditions we identify in the debate of traces as a source of data, but without being too complex to handle. The second one is the digital traces are complex as the cultural object: production, interpretation, social reference, social context are embedded into a form in which its interpretation is the priority.

FIGURE 1. The cultural diamond by Wendy Griswold (2013).



For our purposes, the elements of the digital traces' diamond are slightly different from the cultural diamond one (Table 1). The digital traces are our starting point: the definition we suggest is a digital object expressing a technological process embedded in a form. As we said before, it is the result of two different communities: the techies – the technological community – people responsible for the setting of the digital form, the user – the producer community – people producing the trace by using the platform. This tension between the techies and the users is important during the interpretation process because the digital trace has a technological form that is mainly stable, and a technological use that depends on the user. In other words, the sum of the trace can have a specific technological structure, but their collection tells the story of the behavior of the user. The social process is the reference of the social world: it is revealed by the database of the digital traces. The idea of the process is important because the digital traces can be static, but they are produced by a phenomenon time-dependent: this is an important feature to have in mind during the interpretation of the digital traces. There is a kind of ambiguity between the static side of the digital traces and the dynamic process they are the

evidence. The digital traces are produced by the algorithm on which the platform is based, so they are time-dependent. Usually, these characteristics are embedded inside the digital object as metadata information. From a formal point of view, the timestamp of the single digital trace is static, but their collection is dynamic. So the being a social process is information embedded inside the digital trace, but the dynamism emerges only from the collection of data. Is time a continuum of instants (Dummet, 2000)? From our point of analysis, the answer is yes. The producers are the social subjects that create the digital traces, as we say before, they are two communities the techies and the users. As social scientists, our interest is in the interpretation of the users or the people who produce a flux of traces we have to understand. But this is one of the possibilities we have. For example, if we want to study the technological ideology embedded in the suggestion algorithm, in this case, the digital trace we have to collect reveals that the techies and the users are the same community: the techies are the user. This problem does not arise in some of the archetypes of the social theory of traces – hunter and physician – because the traces they have to handle live-in an ontological world order very different from their own. In other words: traces used by the hunter lives in the natural ecosystem, the trace of the physician lives in the biomedical ecosystem. The technological ecosystem is a socially constructed one, so the digital trace is a socio-technological construction – the decision made by the techies – and a socio-technological production – the users. Different is the ontological world of the detective: the traces he used live in the "criminal" ecosystem, which is at the same time socially constructed and socially produced, like the technological one. So said, the digital social scientist research process has very in common with the detective strategy. The last element of the digital traces' diamond is the reference or the context in which the digital trace became meaningful. The reference is the complex technological and social world a social researcher has to consider for the correct interpretation of the digital traces. The reference is the real difference with the cultural diamond model. If we compare with attention the cultural diamond model and the digital traces' model, we see that the role of the receiver of the cultural diamond is the role of the reference in the digital traces' model. It can be strange at a first sight, but there is a reason justifying this difference. In the cultural diamond, the place where contextualize the cultural object and begin its interpretation is the social world, in other words, is the social world that makes the cultural object decodable and understandable. This is because the cultural object is a significant part of a whole culture. But the digital trace is a piece of information of a standardized platform we use as data of a particular behavior. As we say in the social theory of trace, the traces are an important source of data when we have to study a general process using a collection of specific behaviors. The social researcher

has to recognize the particular behavior as a sign of a general one. But during the interpretation process, the researcher has to understand in the general context – the social process – the element of a behavior pattern. An example can make this point clear. Let's talk about the browser cookies. The cookies are useful because they trace which websites a specific browser has visited during the web navigation. In our model, this statement comes from the relationship between digital trace – the cookie – and the social process – the web navigation. Now we create a database of the cookies of a particular browser. From a quantitative analysis, we see – for example – that the most number of the cookies comes from three websites: Google, Facebook, Youtube. We can infer that the owner of the browser spends his time searching on the web, using social networks, and watching videos. This statement comes from the relationship between producer – the browser's user – and reference – the database of cookies. In the digital traces model, the social process is important to understand why a digital trace can be meaningful in general, the reference is important to understand how a digital trace can be meaningful in particular.

TABLE 1. Comparison between the cultural diamond and the digital traces' diamond.

The cultural diamond	**The digital traces' diamond**
Cultural object	Digital trace
Social world	Social process
Creator	Producer
Receiver	Reference

4. Case studies: the celebrate pride, the broken heart, the celebrity death effects

After the description of the model, we want to use some case studies to see how the digital traces' diamond can be useful to make traces meaningful. For doing so, we will use a selection of case studies taken by different news about the social platforms. Our idea is that the model can reveal some sociological consequences of the use of social media platforms.

The 26 June 2015, the Supreme Court declared same-sex marriage legal and a constitutional right across the United States, with great satisfaction by the LGBT Community who celebrated the decision with a pride parade in San Francisco. To celebrate the civil right victory, Facebook developed an application called – not surprisingly – Celebrate Pride with which was possible to merge the profile picture of a user with a rainbow flag, the symbol used by the LGBT movement. Some people even if agreed with the choice of Facebook, ironize about the real intention of the social network, speculating that maybe the platform was experimenting on its users (Mathias, 2015). The app Celebrate

Pride was not an experiment, according to William Nevius, Facebook spokesperson at that time, but only a result of an internal hackathon – a hacking marathon – and when it becomes popular among the employees, the company decided to make it available to all users globally in the same days the Supreme Court was ruling its decision. The suspicion towards Facebook was not unjustified for a couple of reasons. Firstly because Facebook can run an experiment – a kind of natural experiment – only with the manipulation of the algorithm of the platform. Secondly, because only the year before the company was involved in the scandal of the emotional contagion study, when it had conducted a psychological experiment modifying the emotional mood of a large sample of its users without any consensus, against any ethical procedures (Bennato, 2015a; Hunter, Evans, 2016). If we want to apply the digital traces' diamond to the Celebrate pride case study, we have to identify the key elements.

The digital trace is the profile picture of the user. The profile pic is an important part of the profile element in Facebook because it functions as a presentation of the self (Goffman) of the user, so it is an important way to access some information about the identity of the user. The social process is slacktivism (Morozov, 2009). The term slacktivism is used to define the low-intensity social involvement in political issues by the audience of the digital platforms. More precisely, the slacktivism connected to the profile picture is called pictivism (Matsick Kim, Kruk, 2020), or the use of the profile picture for political involvement purposes. The producer is the Facebook user. The decision to use Facebook's apps to modify the profile picture in an intentional behavior of the user expressing his support to the LGBT movement. The reference is the Facebook feed. By changing the profile pic, the user wants to communicate to his network of friends that he is an advocate of same-sex marriage, although using a slacktivist strategy. As we can see the simple use of the act of changing the profile pic can reveal interesting information from a Social Science point of view.

The second case study is the story of the heartbreak of Koby Soto. The 19 January 2016, Koby Soto, a 28 years old Israeli student and startupper at Guesty[1], posted first on Twitter[2] and then on Hacker News[3] an image illustrating the exact moment when he broke up with his boyfriend. During the day he was wearing his Fitbit, an activity tracker used to collect some biometrical data about the body, very popular in the wellness and fitness community. Late in the morning, he received a phone call from his boyfriend, who wanted to finish their love history. The day flows away, leaving Koby – obviously – in a

[1] https://www.guesty.com/
[2] https://twitter.com/iamkoby/status/689521611611971588
[3] https://news.ycombinator.com/item?id=10932968

very sad mood. In his sleepless night, he wanted to see the track of his heart and he was astounded when he recognized in the data of the tracker, the exact moment when he received the call from his boyfriend and they break up: the 12:30 A.M. The tracker had identified a spike in his heartbeat in the exact moment his love story was ended. Putting the image of the data online (Figure 2), his story went viral, and also the Fitbit company decided to send a virtual hug to him[4] (Lee, 2016; Said-Moorehouse, 2016).

FIGURE 2. The visualization of the heartbeak of Koby Soto.

In this case, the digital trace is the heartbeat. Technically speaking it is not a digital trace, it is a pulse of the heart, a biological trace, but when a sensor captured it, we can consider it as a digital trace. The social process is the emotion. A heartbeat is just a beat of the heart, but we need a psycho-sociological interpretation of this phenomenon. We know it as personal experience but also in the behavior scientific disciplines, there is a connection between the reaction of our body and the emotions we express. For this reason, we can consider the spike into the heartbeat as a sign of sudden emotion, like the one related to a break-up. The producer is the sensor of the digital fitness tracker. The original producer is the heart of Koby Soto, but in this case, we do not have a digital trace but a body trace. So for our model, we have to focus on

[4] https://twitter.com/FitbitUK/status/689818469882294272

the technology which produces the digital trace, namely the Fitbit sensor. The reference is the Fitbit band. The sensor producing the data that we can decode as the digital trace is part of a complex technological platform used for personal data collection, the Fitbit. If we would make a more sociological interpretation of the event, we can consider it as the reference of the simple behavior of the quantified self movement, a community using a personal digital body tracker to collect data of the body for different reasons (Lupton, 2016). The Koby Soto heartbreak case is interesting because we can see that the digital trace is not an intentional one, as the people behavior, but it is an unintentional one, as the body reacts to an emotive stimulus.

For the last case, we have done a simple data experiment in the celebrity death effect. We have collected some data about the most page viewed in Wikipedia with the use of a particular tool[5]. We choose as timespan the period from 24 September 2020 to 23 November 2020, the Wikipedia platform we choose is the Italian one[6] and we decide to collect the pageviews metric about the most famous Italian people who passed away in the period. If we see the timeline (Figure 3) we can see a spike in pageviews, exactly in the day these people have died. This is a classic celebrity death effect: to celebrate the death of very famous personalities, the people "celebrate" their death – among all – by reading Wikipedia as a way for elaborating the mourning (Bennato, 2015b).

We collected the data about celebrities in politics (Jole Santelli), music (Alfredo Cerruti, Stefano D'Orazio), journalism (Gianfranco De Laurentiis, Pino Scaccia), and cinema (Gigi Proietti). The major part of the pageviews' data belongs to the Wikipedia page of Gigi Proietti, a beloved actor whose death greatly affected the Italian public.

The digital trace we used is the number of page views. Wikipedia is a very visited information source all over the world, if we see an unexpected spike in the flow of data, we can correctly assume that something happened to the page or the person connected to the page. The social process is the celebrity death effect. There are many reasons because a Wikipedia page of a celebrity is suddenly visited by a great number of people, usually, the first reason is the death of the celebrity. The producer is the Wikipedia reader. The pageviews are a metric that testifies the presence of interest by the reader of Wikipedia, so the responsibility for the growth of the pageviews are the readership. The reference is Wikipedia. Wikipedia plays an important role not only because is the platform that collects data about the presence of a reader on a particular page, but also because there is a semantic in this behavior. Every Wikipedia page is not a simple webpage, it is an encyclopedia's article with all that follows from it. In

[5] Wikipedia Tool forge: https://pageviews.toolforge.org/
[6] Wikipedia Italia: https://it.wikipedia.org/wiki/Pagina_principale

our little experiment, we have seen how the knowledge of the social constraints of a particular platform can be very useful for the correct interpretation of the digital traces we can collect with it.

FIGURE 3. The celebrity death effect in Wikipedia.

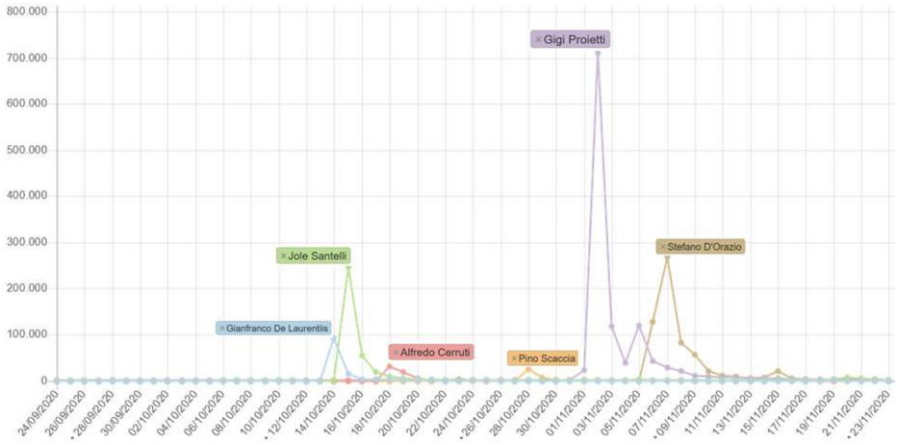


TABLE 2. The digital traces' diamond applying to the three case studies.

The digital traces' diamond elements	The celebrate pride	The broken heart	The celebrity death effect
The digital trace	Profile picture	Heartbeat	Pageviews
The social process	Slacktivism	Emotion	Celebrity death effect
The producer	Facebook user	Sensor	Wikipedia reader
The reference	Facebook feed	Fitbit band	Wikipedia

5. Conclusions: the digital trace as a way to overcome the quantity/quality dichotomy

The digital traces are an important source of data for the social researcher: in a world completely embedded into a digital ecosystem, the traces we collect from the digital platforms can give a completely new way to look at the social relationship in the XI century. What catches the eye is that the use of the digital traces is neither quantitative neither qualitative, but belongs to both. With the quantitative approach, they share features like standardization and quantification. With the qualitative approach, they have in commons the importance of an interpretation stance. We can consider this duplicity as a typical property of the computational objects. Different approaches in the use of digital data in social and human science as digital methods (Rogers, 2013),

digital sociology (Marres, 2017), culturomics (Michel, Shen, Aiden, Veres, Gray, Pickett, Hoiberg, Clancy, Norvig, Orwant, Pinker, Nowak, Aiden,, 2011), cultural analytics (Manovich, 2020) are converging into the idea that the procedures used in researching with digital, break down barriers between quantification, computation, and interpretation. We think it is due to the nature of the computational objects: they are standardized (number), but they are also information (text) machine-readable (computation), and socially constructed (technology).

The digital traces are also important for a professional approach to the use of data. In other terms, there are different professional traditions linked to society care – criminology, psychology, security expert, social care – which can benefit from an abductive approach to digital traces. For example, the case of OSINT. Open Source Intelligence – OSINT – is a method used to collect information from the web, using data, sources, and tools freely accessible on the Internet. Currently, this approach is used by security experts (web security), enforcement officers (anti-terrorism), data journalists (reporting), and other professionals who have to collect information about particular subjects or for investigative necessity, but it can be useful also for Social Science researcher.

Informed use of digital traces is becoming necessary also in the field of data science and computational Social Science because they are the main approaches to benefit from the massive data collection. The newly disciplines who were born at the crossroads between statistics, physics, and computer science and who are working on socially structured data – for example, social media data – are not characterized by a debate in the method when they use this data. Sayed differently, the data produced by the social and human process are data that have at the same time a structure and a semantic, if we want to use to structure, we have to know the semantic: it is mandatory the interpretation of the data or a strict definition of which processes they refer to. Usually, this attention is not focused in the STEM sciences: a correct problematizing of the digital traces can be helpful in this way.

The model we have suggested is just a modest proposal for a conceptual tool useful to extract from the digital traces all the best we can for the research in SSH (Social Science and humanities), posing attention to accurate use of formalization (for example numbers), conscious use of digital tools (e.g. scrapers) and a new role for the researcher (the importance of the interpretation). We see moving toward us a horizon of more complex digital tools like machine learning and autonomous algorithms also in data analysis. For this reason, is important to back to the roots of the reflection on methods, to avoid the ideology of the completely automated analysis of information. And the digital traces are here to testifying it.

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