Numbers

by Flavio Bonifacio[1]

Abstract
The first section introduces the problem of numbers as a representation of reality. The second and third sections underline some difficulties that one may encounter in communicating numbers and introduce the problem of the institutionalisation of number processing production as a system of guarantee. The fourth and fifth sections see numbers as a part of a model. The sixth and eighth sections track a two-way path between numbers and society, while the seventh mentions the problem of the representation of numbers. The conclusion recognises as an urgent problem the need for an alert system on the uses and on the production processes of numbers.

Keywords: quantitative social research; communicating numbers; reality representation; use of numbers;

1. Numbers and objectivity

It is not easy to identify the border between what is certainly and objectively measurable and what is not. It would seem that everything that can be expressed with numbers or, more generally, that which can be formalized in mathematical models is objectively measurable. On the other hand, what it is not possible to formalize or express through numbers would seem not to be objectively measurable. In these brief notes I shall explain how the idea that Numbers cannot be considered a criterion of demarcation (following what I have already discussed with regard to Popper, [Flavio Bonifacio 1996, part III]), how numbers are not more true than other representations of reality, that every statement about reality must be responsibly supported, that it is necessary to support this responsibility with an explicit agreement between the producers of the data, that this agreement must be institutionally granted, that only this agreement can make it possible not to surrender the objectivity of the measurements to the tastes of the moment.

Here below I report some difficulties in communication through numbers which I shall summarise in four questions: (1) What do we communicate with numbers? (2) Who builds those numbers? (3) Who communicates the numbers? and (4) To whom do they communicate the numbers?

First of all I think I should warn the reader about the style in which this article is written. I have chosen to use direct language to stress the urgency of the problem posed, i.e. the misuse of numbers. What seem to be opinions are simply statements that concern my view of the real state of things, not their scientific representation. They concern what I feel to be real and what I want to communicate. It is not my intention to provide here an exhaustive description of the real meaning or interpretation of specific numbers. Others have already done it better and more thoroughly and I shall direct the reader to these authors. I want to communicate instead the feeling coming from years of work in the field of data analysis, the feeling that I have contributed towards building a sand castle, the feeling of disillusion. Nevertheless when possible I have used scientific methodology, see for example section 5, to illustrate my point of view which is, after all, optimistic: it is worth fighting for a better and more "true" representation of reality because Objectivity is not given, Objectivity is a conquest. Despite the fact that it is rather nonsensical to say that reality is "what I feel to be real" I think that the sentiments here narrated are shared also by the target audience of this article who I think are mainly data workers and numeracy authors.

2. Problems of communication with numbers

Typically, with numbers we communicate "quantities" - the number of tourists in a place in a certain period of time, the numbers of those employed, the number of the victims in some natural disaster etc. While we are not surprised that a piece of news, a fact, can be described with words and in ways that are also very different and we have no difficulty in admitting that a description is constructed in different ways and that of a fact we can give different descriptions, we think that the "number" exists per se and that it is not therefore debatable.

To show as a context may be differently represented with words, it is instructive to read the various descriptions that may be given of a banal event, such as the one which took place on what could be any bus S during the rush hour. This is narrated in 99 different ways by R. Queneau in his book Exercises in Style, and some excerpts from the translation by Barbara Wright are provided briefly here below, just to

give a flavour of Queneau's book:

> *Notation (that is the master piece that is afterwards narrated in 99 different ways)*
>
> In the S bus, in the rush hour. A chap of about 26, felt hat with a cord instead of a ribbon, neck too long, as if someone's been having a tug-of-war with it…(continue)
>
> *Cockney (The cockney way)*
>
> So A'm stand'n' ahtsoider vis frog bus when A sees vis young Froggy bloke, caw bloimey, A finks, 'f'at ain't ve most funniest look'n' geezer wot ever A claps eyes on. Bleed'n' great neck, jus' loike a tellyscope, ……(continue)
>
> *Sonnet (the sonnet way)*
>
> Glabrous was his dial and plaited was his bonnet,/ And he, a puny colt-(how sad the neck he bore,/And long)-was now intent on his quotidian chore-/The bus arriving full, of somehow getting on it……(continue)
>
> *Mathematical (the mathematical way)*
>
> In a rectangular parallepiped moving along a line representing an integral solution of the second-order differential equation: Y''+PPTB(x)y'+S=84 Two homoids (of which only one, the homoid A, manifests a cylindrical element of length L>N ……(continue)
>
> [Barbara Wright, 1958]

Instead it would seem that reality translated into numbers is in some way more true than that translated into words. That regardless of evidence to the contrary: probably the "true" number of tourists, the "true" number of the employed, the "true" number of the victims of that natural disaster will never be known. As for other cases, we can think of the rate of inflation or the forecasts of the development of the Gross Domestic Product (GDP), or the number of participants at a political or trade union demonstration. The construction process of such data is so complex and at times even biased [2], that it is difficult to trust in them blindly.

3. Institutional truth of numbers

Additionally, a much simpler and immediate number, which would appear to be alien to any dispute as to its validity, is not truer than others. For example, the population of Italy on the date of the population census is an "official" number, certainly, but it is not "true." The number of residents (or of those present?) in Italy is true because it is official and it is official because ISTAT [3] says so. ISTAT is the guarantor of "truth" for two reasons: 1) in accordance with the procedures and the methods of measurement that it uses and 2) because it is an organization of the Italian State entrusted with that task. I would say that on account of this role ISTAT is one of the most important institutions of the Italian State. If it has been certified by ISTAT the official number of residents becomes the "legal" number and we speak of the "legal" population. Nevertheless there have been situations in which the "legal" number of the population of some Italian municipalities was (and is) manifestly false: there have at times been, and at times still are, circumstances in which it is convenient for the municipalities to be above or below certain thresholds of population

4. Usability of the number and models: the construction of the number is a craft

As evidence of how numbers are taken seriously, at least apparently, we can think for example of how many administrations justify the numbers of their expenses with (the numbers) of other measures: the number of residents in a certain zone of the city to decide about the location of health services; the number of passengers on some railway lines to decide on whether they (the lines) should survive or be suppressed; the birth rate expected for the near future in order to organize a school system, the surface area of apartments or the number of family members to plan refuse collection. But where do all these numbers come from?

Leaving aside the problem of the production and preservation of the sources and in general of the collection of the data, let us focus our attention on the process of their manipulation and processing. The number is usually the result produced by a more or less complex calculation carried out by people who are experts in the techniques required, in particular in statistics. It ranges from the most elementary case, the enumeration of objects, to others that are less elementary, in which the processing of the number in question involves the use of complex computational procedures. In all cases, however, the procedures have a common point of departure - the definition of the objects that will be subjected to the abstract procedures. For example, in the case of counting the population it is necessary to agree on whether to count the residents or those present. To count the employed it is necessary to agree on who should be included as employed: only those with an open-ended contract, workers with temporary but renewable contracts, those with temporary contracts for specific projects, or occasional workers. From the beginning there are therefore varying degrees of freedom. And each degree of freedom can be associated with a different interpretation.

In other cases, which are less immediate, the production of the "number" in question involves not only counting or an estimate, but also a forecast or, better, a predictive model. The model is the crystal ball that the experts use to make their prophecies. For example, in estimating how much refuse will be collected in a certain area, it is necessary to think of the production of refuse per capita or by family and to attribute a quantity to each family, depending on the number in the family and on the surface area of their

residence. The forecast will thus be "numerable" with an assessed number of people (P) and surface area (S). For example: Q=a+b1P+b2S.

The coefficients for the weight (b1 and b2 in the example) have to be observed and usually this is done by means of protocols that are realised in surveys. This procedure, whose description we have deliberately excluded from these brief remarks, is at times quite a complex one, and when all is said and done, it is on this procedure that all the results of the estimates depend.

The simplest calculation or the most complicated equation are in any case a part of the same set of instruments with which we build estimates on aspects of real life, measured by protocols of observation. With these estimates we construct models that enable us to represent reality and establish by means of successive simulations a rule of behaviour in relation to some objective. In the case of the example, the objective is provided by the excellent distribution of a public service and in establishing for it a fair value for the contribution that families will be called upon to pay as their due.

Here it is important for us to stress that we are talking about at least two operations that are the task of experts: the definition of the model and the estimation of the same. More precisely, the expert will undertake to translate into a model the customer's requests, whether the latter is public or private, and to conduct the necessary investigations to estimate its parameters.

5. More on numbers and models

In this section we will see how models give sense to numbers. Models may be viewed has a particular (formalized) point of view, or conceptual framework or context [Paulos, 1998, p. 14 [4]] in which numbers find their true reference or correspondence to the reality that they describe. Once the reality has been captured in a net of conceptual frameworks or models, numbers begin to be related to it in an unambiguous way and with an unambiguous meaning. Let me show you an example. The example is drawn from a study about school achievement and SocioEconomic Status (SES) [Bonifacio, F. 1987]. The study compares school achievement in two different types of high schools, one of which is of a general type, the other one of vocational type [OECD 1999]. The students of the first one show better achievement than the students in the other one. As students with lower SES are more likely to be enrolled in vocational schools there is a strong relationship between SES and achievement, although this may be not true inside a single school type (see also [Raudenbush, S.W., Bryk A.S. 2002, p.16-22]). Imagine transferring the situation described for two schools into one school and referring the findings related to the observed differences in achievement in two school types to two classrooms. In the first classroom the teacher, Aristogitone, is severe; in the other second classroom the teacher is Valdo, who is less strict (for the sake of simplicity there is only one teacher per classroom).

Both of them are teachers who evaluate the achievement of their students in a strictly technical way and in their classrooms the probability of obtaining good achievements is exactly the same for each level of a student's SES. The only difference is that with Aristogitone the probability to fail is 30%, while with Valdo it is 10%.

Both teachers are also perfectly impartial in their evaluations. But knowing that Aristogitone's students are more likely to come from a lower SES we would argue that they are, taken together, biased and unfair with respect to those students.

Both of these things are true: the teachers are impartial from the point of view of their own classroom; they are biased and unfair from the point of view of the school system. What is changing is the perspective of the observation point: we consider the general situation, the entire system (both the classrooms), and teachers as only one portion of it (just their classrooms).

Both the opinions are well supported, but what is more likely to happen is that teachers will think that their situation represents the true reality and therefore that there is no relationship between SES and achievement [Bonifacio, 1987,p. 98]. This is one of those cases in which true observations give rise to false, unexpected consequences [effets pervers, see Boudon 1977].

An analogous example is reported by Paulos [Paulos, J.H, 1998, p. 39]. The example is drawn from race relations in USA and shows how, supposing the same diffusion of racism among white and black people (10 percent of racists in each group), blacks will suffer disproportionately from racism due to the different marginal distribution of whites and blacks in the population [5].

Now I think that what I have stated above, that is that the true meaning of numbers comes from the model in which they are located, is clearer: by changing the perspective from which we consider the numbers, the numbers might change their meaning or support different interpretations. But there is a step further: the model may be formalised (in a more or less easy way). For instance the example related to achievement and SES may be formalised with the following expression [Bonifacio,F. 1996, p. 45]:

I believe that what numbers are telling us is neither the result of biased interpretations introduced by advocates or activists, nor a sum of technical mistakes in methodological issues - such as guessing, defining, measuring, sampling [BEST, p.32-58] - that might have been done more or less well. Numbers are telling us the result of the application

$$Pr(R_1|C_i) = Pr(R_1|E_1) + Pr(E_2|C_i) \times [Pr(R_1|E_2) - Pr(R_1|E_1)]$$

where:

$Pr(R_1|C_i)$ = probability to fail R_1 given the SES level C_i

$Pr(R_1|E_1)$ = probability to fail given the school type (General E_1)

$Pr(E_2|C_i)$ = probability to be enrolled in the vocational school given the SES level C_i

$[Pr(R_1|E_2) - Pr(R_1|E_1)]$ = difference between the probabilities to fail between the school types

of a model. Therefore numbers (or more generally data) tell us things that may be seen as true only inside the model that generated them. In this sense numbers exist only in an interpreted form, shaping them in only one meaning. Only in this sense are numbers true both for me and for you: it is just because we understand the underlying model that make them true.

Just for sake of completeness I shall report my view here on the relationship between natural language used in literature, for example (once again, see Queneau), and scientific formalised models, or between storytelling and logic, mathematics or statistics as Paulos would say [PAULOS 1998, p.104-105]. This view is reported in [BONIFACIO, 1996, p.9] and draws the mentioned relationship, referencing both literature and models to knowledge of the world. This view simply tells us that literature and mathematics are both "right" modes to know the world, but in a sort of specialized and complementary way. Reality is not so simple to fit definitely in a model. Or vice versa, a model could not be so complex to fit the reality at a delta level, where delta is less than a given ε taken as small as possible (and also even if it were possible it would be useless). All details of reality are not completely described by a model, which is in fact a simplification of the real world that gives us only an averaged rough idea of what is going on in real life. Natural language embedded in literature (poems, novels, stories) gives us the possibility to go deeper into the real world, helping to depict also the most individualized and specific aspects of reality. In this way models and literature cooperate to build a more exhaustive world knowledge. Literature starts where the model ends, so to speak. Finally, this is the ontological possibility to lie that links words and numbers: both try to discover the real world, both do this in the midst of social constraints and relationships that conceal it and shape assertions about it.

6. The social construction of numbers [6]

In order for there to be a model and an expert to assess it a problem arises from an objective to be reached which in the example reported in section 4 is the attribution of a fair price for families to pay for refuse collection. When the objectives are of this nature, in other words connected with public services[7], the solution to the problem generated involves various social actors and various points of view. In this example the actors are the representatives of the administration that commissions the survey (the customer), the experts of the research firm, the families as they are part of the subject under investigation. The interaction among the protagonists (problem, objectives, assessment, model on the one hand; customer, experts, families on the other) constructs the number that represents the solution to the problem. Or better, the number that constitutes the solution of the problem will emerge from this interaction.

The expert is a subject of the interaction as he or she knows the process of the construction of the number and knows that the process of construction of the number is "methodologically" guaranteed. The methodology for the expert is not an esoteric mystery. It is composed of the discussion of problems in relation to objectives (for example, how much refuse disposal costs), of measurements, of statistical techniques for the modelling and forecasting, as we have seen in the previous part.

The customer is the subject of interaction as he or she knows better than the others the objectives and problems that arise in the attempt to achieve them. Above all he or she knows why it is necessary to propose certain objectives. He or she has, in other words, a political vision. The customer is the bearer of interests that in some way pre-exist the course of the construction of the number and that influence it.

In turn the subject of the survey is the subject of interaction as he reacts to stimuli to which he is subjected. He or she may, for example, answer a questionnaire or refuse to do so.

In this process of translation of the problem into a model,

of estimate or measurement of the parameters of the same, of further translation of the model into procedures of calculation, of navigation in the midst of motivations, preconstituted interests and recalcitrant subjects of research, lies the objectivity of the "number." The data are objective because there exists a controllable process that produces them and there exist those who produce them, who assume responsibility for them, a responsibility constructed among several subjects that interact in the attempt to solve the problems.

Finally, then, subjectivity, in the dual declination of control and responsibility, is the guarantee of objectivity. In other words the truth of the data does not lie, or does not only lie, in its congruity with reality, but also in the fact that we agree, for a series of reasons, to consider it real.

This process of social validation of the data constructs the objectivity and gives authority to the data, in other words the data is institutionalised. This process of approval of the data is similar to what occurs during a trial with the jury [Popper 1934]: despite the fact that the facts are facts, they become truly facts, in other words objectively facts, only when the members of the jury have confirmed them.

Qualifying objectivity as a two-way objectivity, one theoretical and empirical and the other one social, sets the research data on a "politically" marked path, thus rendering it permeable to the objectives of the actors involved, above all of the customer. The inclusion of the objectives in the process of production and evaluation of the data (the data is correct if it confirms the objective or at least it does not contradict it) risks flattening it to the existing situation and rendering it sensitive to the distribution of power. The data supports the opinions of those who produce it or, better, of the person who buys it: the process of institutionalisation that we have spoken about, instead, contrasts this outcome, recognising the two-way track from which the data originates, and its dual nature of guarantor of objective reality and subjective will. Explicitly considering the point of view of the expert who produces the data, the procedure of institutionalization outlined above protects the data (and their interpretation) against incorrect practices that are aimed at fixing the data (and their interpretation) on preconstituted interests.

Paradoxically we have come to the point where, to defend the data from interference from politics, it is necessary to put them back inside politics. This can be done by constructing the political instruments for imposing respect for the procedures of construction, production and validation of data.

In effect, with numbers we communicate solutions to problems, not objectivity tout court. The numbers are only apparently produced and communicated by an expert (consultant, person or company producing data) for a customer. In reality the numbers are produced by both, in a process that moreover exposes both to the intemperance of the subject under investigation [8].

7. The ultimate number transformation: Graphics

Both parties (the expert and the customer) then communicate the numbers to a third party for whom those numbers become reality. The third party may be the board of directors of a company, the dean of a faculty, the readers of a newspaper, the audience of a TV programme, the participants at a convention. In this phase (but also before, in the meeting between the producer of the data and the customer) the numbers undergo a metamorphosis, which reduces them to static or animated little figures, figures with their own meanings that do not require any further interpretative effort -- at last reality is within everyone's grasp, easy to understand and, above all, objective. The number, stripped of its Arabian consistency and dressed up in multi-coloured clothing, guarantees this.

I am referring here to another source of misinterpretation of numbers pertaining to the communication world: numbers are not only presented as they are, but transformed in a simpler, more intuitive fashion. This simplification (nearly always graphication) is often an oversimplification in which something important gets lost: the way in which numbers have been built, that is the underlying logic or model [9]. That is, as we have seen before, the only way to recognise the truth of numbers. One of the most common misinterpretations is induced by reporting quantities using quantities adverbs: very few, a few or many, a lot of, and so on. The right question, the question that must be modelled and that often gets lost here is: how much is it a few, how much is it much, or many, or a lot? The benchmark measure is often omitted. The same happens with graphics: quantities depend more on how the axes have been scaled than on real numbers (measures). For example, fig. 1 reports the scores achieved by the average customer in a hypothetical customer satisfaction survey on satisfaction for some items (x-axis) and their supposed importance (y-axis) scales. In fig. 2 the same results are reported, shifting the position of the axes. While in fig. 1 the threshold between bad and good is fixed to 5 (in a scale 0-10) in fig. 2 it is fixed at 7.5 instead and the related semantic has been changed accordingly. The model behind fig. 1 says: "Values above the expected mean of a random scale ranging from 0 to 10 are to be considered good. Therefore values above 5 are good ones in both scales". This decision means that on average customers consider all items to be pretty good (see fig. 1). If we suspect that for some reasons customers over evaluate the product/services offered we can decide to increase the threshold value to the means of the observed scale, for instance. The model behind fig. 2 says: "Values above the observed mean of the measured scales lying in the observed range are to be

considered good. Therefore values above 7,5 (for example) are good ones in both scales".

Both figures represent true facts, but inside different models or interpretations. Knowledge of the underlying models is essential to understand what the graphics mean and knowledge of pre-established goals (or interests) is

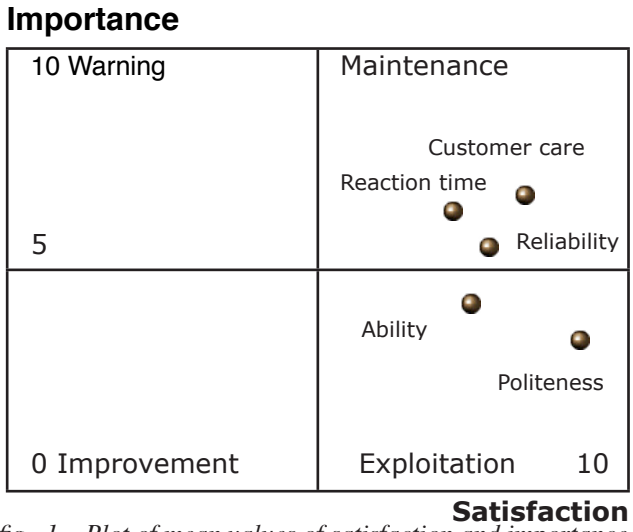

fig. 1 – Plot of mean values of satisfaction and importance for some Customer Satisfaction items. Value of threshold is 5.

essential to understand the models. If the interest is to reward workers or sellers for their good performance probably the first model will be chosen. If the interest is to underline aspects that are less appreciated than others by customers and therefore represent critical points the second model is better. In fig. 2 the items "response time" and "ability" are in a critical position, while they are not in fig. 1.

In conclusion: graphics must not be taken as direct signal for the truth, but for the expression of model results; graphics, as stakeholders of numbers, must be interpreted inside a model, just as the numbers are.

8. The numerical construction of society

Despite this "intentionality" [PAULOS 1998, p. 92] of models, this plasticity of models, today nearly every opinion or policy maker uses numbers (data) to support his arguments without a model. Or better they put data inside an empty model, that is a model that models nothing. Despite the fact that they use more data than in the past and therefore they need - even more than in the past - empirical research tools such as opinion poll surveys, they have not developed what I would call an objective feeling, where objective feeling is the special aptitude to respect numbers

fig. 2 - Plot of mean values of satisfaction and importance for some Customer Satisfaction items. Value of threshold is 7,5.

and their special ability to represent, in some way, reality. What happens instead is that everyone looks for the most convenient numbers that best apply to a particular, usually his own, point of view. This behaviour does not only have to do with the communication sphere. In the field of communication it would still be comprehensible and even safe. When a person knows what happens, he or she may decide whether it is safe to say it now or tomorrow, whether it is safe to say it in this or in another way. But what is wrong is that customers do not want to hear what numbers would help to discover. They fear novelties and truth, because novelties may be unexpected and truth may be dangerous in a particular and pre-established framework. This, in conjunction with the power that opinion and policy makers usually have for addressing goals by providing budgets for research work, makes it highly likely that there will be a representation of the world which has been obtained through rigged numbers, a biased mirror of the reality. Real society does not appear in those numbers. What appear are societies that "I want to make existent and that are more convenient for my existence." And so there exist as many descriptions of society as there are opinion and policy makers.

Conclusion

As the picture I have described is rather a bleak and pessimistic one, it is natural to ask the following question: why continue to work with numbers (data)? There are at least two answers to this in my opinion. The first is a cynical one, but I think it is more common than generally believed. It goes more or less like this: "Yes, I know that the numbers I am now working on will probably misused and have perhaps also been misworked. But this is what my customers are asking me for and I have to meet their needs. In the end the customer is always right, and he or she is even more right in the special case when he or she is wrong." Behind this way of thinking lies the belief that "all is for the best in the best of all possible worlds" and like Voltaire's Candide we may only believe in this world, thinking in the exact way we are expected to think [Voltaire, 1745].

The other answer is, to my mind, more challenging, although more expensive in terms of personal investments and less satisfying in terms of job returns (i.e., earnings and social appreciation): "Yes, I know that the numbers I am now working on will probably misused. Furthermore I am encouraged to work badly, in order to look for the numbers requested instead for the necessary data models. Nevertheless, I think that customers have to learn how to know the real world, because only the most advanced knowledge of the real world will help them to succeed. And I will make every effort to help them to get the necessary (and perhaps) right knowledge. Despite the pressures I accept the risk of being judged a bad supplier of numbers and I will continue to look for the (perhaps) right description of the world, i.e., for the (perhaps) right numbers instead for the requested numbers."

There are authors that recognise that there are problems in interpreting and presenting numbers [10] , recognise their social nature and the possibility that numbers may be shaped by different interests. Their approach for solving the problem is different from the one presented here. I would indicate the former as an illuminist, educational and individualistic approach. Illuminist because, in this interpretation, knowledge would suggest the right interpretation; educational because the right interpretation may be taught, or at least the methods to get the right interpretation may be taught; individualistic because the learning process to be used to get the right methods or interpretation is the result of an individual will (or several individual wills). In this view these conditions are necessary and sufficient to guarantee the right interpretation and presentation of numbers, or at least to recognise when the numbers published are suspicious.

What I have suggested in this article is that all this is not sufficient, although it may be necessary, if there it is not an explicit agreement upon what has to be considered true or the right interpretation. The agreement must be stipulated among the supporters (advocates or activists) of different views or interpretations or disputed contexts. "Supporters" here means every kind of person or institution that may influence the numbers' production: governmental agencies, private firms, data producers, single researchers or university departments, journalists, political parties, trade unions, etc. As we have seen before, each one of them enters into interaction with the other to build what we call – in short - a Number. Now we can add a new specificity: these supporters interact with their own point of view and their own defined context. These different views have to be collected in a sort of Round Table where differences will be recomposed (mediated) in the light of the procedures and methods used. While models and context may change according to a particular point of view, procedures and methods do not change across the context. For that reason procedures and methods establish the necessary common language among "supporters". This capability of methods is Science Objectivity and the Round Table is the institution that guarantees its application. Just like in democracy, where we have institutions that formally guarantee the equality of rights in a society where rights are unequal, in the number production process we need an institution that formally guarantees the equality of methods, by which models and numbers will be evaluated.

What I have written merely signals a risk. The risk of being engaged in dirty, or at least not thoroughly honest, work against our own will. But a person's will is not sufficient to counter rich and powerful forces. The principal way to counter these tendencies is the institutionalization of the relationships at work, just as they are, as I said before. In other words, the producer, recorders and archivists, customers, experts and so on must be put together to build an institutionalized warning system: a system that systematically surveys not only the physical or logical condition of the data, but first and foremost the use and abuse of the data and the entire process of the production of data and numbers. I know too that all this is not a novelty and that IASSIST and IFDO in their daily work have already been operating in this way for decades. Perhaps one might think that all this would be useless because the custodian and guarantor of objectivity, the Round Table, is the University: I have some doubts that at present the University can do this alone. Indeed there are some good reasons for stating that it is too late and that politics now governs procedures that do not belong to it (those of scientific research): for example, to determine careers. Moreover, others will say that in the moment that the University enters the market, not so much through individual practices, consultancy by its professors - which has always existed - but as an institution that sells its own resources, it dirties its hands and can no longer act as disinterested guarantor (super partes). In these circumstances Academia seems no longer able to act as the umpire.

I do not wish to be too drastic: it is certain, however, that the situation is not easy. Anyone who bases his work on the expectation that the data are, in some way, immune to interested speculation, that there exists a hard core of knowledge, should be prepared to give the University a hand in operating as guarantor. This until the desire for honour and laurels rather than base profit returns to being the just aspiration of its followers and mentors [11].

These short remarks are intended just for the record: it absolutely necessary for this alert system to survive to take advantage of the contribution that undoubtedly empirical social research may provide for a better and unbiased knowledge of the world.

And when I say this I am thinking above all of my own country.

Notes

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2 That is shaped by particular point of view:"…In short, even official statistics are social products, shaped by the people and organizations that create them…" [Best, J. 2001, p. 26]; "…advocates who conduct their own surveys can decide how to interpret the results.." [Best, J. 2001, p. 48]. Best's book contains a lot of examples of uses and misuses of numbers to which I refer readers for reference.

3 ISTAT is the Italian National Institute of Statistics

4 "While some figures are almost self-explanatory, statistics without any context always run the risk of being arid, irrelevant, even meaningless."

5 The probability that Paulos and I both gave not only almost the same example, but also used actors with almost the same name, Waldo [Paulos, J.A. 1998, p.91] and Valdo respectively, is very low. In some sense we always have to be careful with numbers, even with small numbers, in spite "of the stunning insignificance of the vast majority of coincidences" [Paulos, 1998, p. 61]

6 The title of this section is not just aping the famous book of Berger and Luckmann [Berger, Luckmann 1966]. I am deeply convinced that numbers are fundamental in representing reality and therefore subject to the same constraints as reality is. In the same sense see [Best, J. 2001, p. 27]: "All statistics are created through people's actions: people have to decide what to count and how to count it, people have to do the counting and the other calculations, and people have to interpret the resulting statistics, to decide what the numbers mean. All statistics are social products, the results of people's efforts". See also [Paulos, 1998, p. 84]

7 In reality the field of application is general and it regards the whole world of social research.

8 Once again I shall turn to fundamental pieces of literature for help, and once again I shall refer the reader to Queneau. Two books are fundamental: the Flight of Icarus [Queneau, R. 1973] and The Blue Flowers [Queneau R., 1985]. In these books Queneau uproots the protagonists from their context (novels in the case of the former, Stories in the case of the latest) and makes them build their own "context" across the original ones from which they have been abruptly extracted. In the same sense the reader may be referred to The Castle of Crossed Destinies by Italo Calvino [Calvino, I. 1973]. In this book the context is randomly selected from and inspired by Tarot cards.

9 Here I am not thinking of the several ways in which liars may manipulate their graphic tools to induce false representations of reality. See for example [Jones, G.E. 2007]. The "graphication" may lead to a false representation of reality because it is further away from reality than models and numbers are.

10 Among them the quoted authors [Belt, J. 2001] and [Paulos, J.A. 1988, 1998].

11 Although the question is an ancient one: Francesco Petrarca, the great poet, already noted in the fourteenth century:
"Qual vaghezza di lauro, qual di mirto?/Povera et nuda vai philosophia,/dice la turba al vil guadagno intesa./Pochi compagni avrai per l'altra via/…" [Petrarca, F. 1366]. The quotation is just paraphrased in the text

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