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WHY HAS LATOUR'S THEORY OF CITATIONS BEEN IGNORED BY THE BIBLIOMETRIC COMMUNITY? DISCUSSION OF SOCIOLOGICAL INTERPRETATIONS OF CITATION ANALYSIS*

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The paper discusses the often lamented lack of a theory of citations, and the lack of a sociological theory in particular. It draws attention to one proposed theory and discusses the potential reasons why it has not been generally accepted as the theory of citations, despite its merits in explaining many phenomena in the citation behaviour of scientists. This theory has been expounded by Latour and presented, in particular, in his book entitled *Science in Action.* [1]

Detour to the Mertonian past

It is an accepted notion that the normative view of science expounded by *Merton*, provided *a sociological*[a] interpretation of citation analysis in the late 1960s and 70s. According to his theory, a recognition of the previous work of scientists and of the originality of their work is an institutional form of awarding rewards for their efforts. Citations are a means for providing such recognition and reward.[b]

The first suggestion of a Mertonian interpretation of the meaning of citations was presented as early as 1965 by *Kaplan*[2] in fact quite soon after the first citation index covering all major fields of science was published in 1964. *Merton*[3] lent his authority to this interpretation in print as late as 1979 in the foreword of the book by *Garfield*, entitled *Citation Indexing*[4] which represented an authoritative and 'official' view of the field, official in the sense that the institution, ISI, which published the citation index propounded this view. Ironically, the book was published at a time when Merton's normative theory of science was losing ground in the sociology of science. Critical studies of the Mertonian ethos and norms had appeared since the late 60's.[c] The new sociology of scientific knowledge which paid attention to the technical content of

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science gained more impetus and acceptance in the 80s. As a consequence, Mertonian ideas became less attractive among scholars in the field of science studies. In addition, since the mid 70s, several empirical studies had been carried out paying attention to the contents and contexts of citing.[d] These prompted criticism concerning the use of citations as a reward and as a measure of quality, significance, importance, or influence – various terms used in this connection.

It is an interesting question to what extent the Mertonian view was in fact used implicitly or explicitly by citation analysts to justify their practice and to what extent it was mainly used in official histories. For example, the well-known book by *Cole* and *Cole* entitled *Social Stratification in Science*[5] used citations as a measure of quality. The authors quoted *Merton* extensively, but not once to legitimate the use of citations. These were taken to represent quality or "relative scientific significance" without further justification. Merton's views may have been taken as self evident by his pupils and those working within the same framework and, therefore, not in need of being explicitly stated. This may reflect the fact that in everyday research practice and in the reporting of it, scholars do not necessarily refer to their underlying assumptions or theoretical justifications unless these are being questioned.

An important area of application of citation analysis since the very beginning of citation indexing has been the evaluation of performance.[e] This type of use is based on the assumption that citations indicate a positive sign of the value of the cited documents for subsequent research. Such an assumption has been supported by empirical findings concerning correlations between citation counts and other performance measures[6] as well as by Merton's theory. To legitimate the evaluative use of citation analysis, in 1983 *Martin* and *Irvine*[7] launched the notion of impact which incorporated empirical findings both critical and supportive concerning the practices of application of citation analysis.

New theory of citations

A clear break with the Mertonian tradition is based on the elaboration of the rhetorical function of citations. *Gilbert* was among the first to provide such an interpretation in his article of 1977 entitled *Referencing as Persuasion.*[8] The argument was vigorously advocated by *MacRoberts* and *MacRoberts.*[9,10] In 1987, a whole issue of *Scientometrics*[11] was devoted to a refutation of their point of view. The most elaborate formulation, however, has been provided by *Latour* in his book entitled *Science in Action.*[1]

Latour's views of citations are part of his research on the social construction of scientific facts and laboratories, *science in the making* as contrasted with *ready made science,* that is, beliefs which are treated as scientific facts and not questioned. In contrast with the Mertonian views, Latour's views, similar to those within the various new perspectives in the sociology of scientific knowledge, emphasise that the boundaries between the social and technical in scientific practice are blurry. Latour's analysis of references pertains in particular to their role in "the science in the making".

In this phase, according to *Latour*, references in articles are among the resources that are under the authors' command in their effort at trying to "make their point firm" and to lend support to their knowledge claims.[f] Other "allies" or resources are, for example, the editors of the journals which publish the articles, the referees of the journals, and the research funds which finance the pieces of research.

References are, in Latour's military[g] jargon, one of the layers in "successive defence lines" which indicate that the text is scientific.[h] When using references to other scientists' texts, scientists transform the earlier literature to suit their needs. They can even misquote the earlier texts and transform their meaning and cite them for reasons completely different from the intentions of their authors.[i] Sources "may be cited without being read, that is perfunctorily; or to support a claim which is exactly the opposite of what its author intended; or for technical details so minute that they escaped their author's attention; or because of intentions attributed to the authors but not explicitly stated in the text".[j]

Latour's theory has an advantage over that of Merton's in that it can explain many of the findings made in the so-called citation content and context studies mentioned. These findings relate to the contents of citations, which are vastly different and vary from one situation to another; also the fact that the surrounding textual contexts in which they are used differ greatly.[12,13] Such differences include whether citations are positive or negational, essential to the referencing text or perfunctory, whether they concern concepts or techniques or neither, whether they provide background reading, alert readers to new work, provide leads, etc. These findings question the validity of Merton's claim that citations are a recognition of intellectual debts and original research findings. *Latour* makes understandable the heterogeneous and apparently chaotic picture of the actual use of citations. In spite of the variety of uses, references have a major function in scientific texts: that of mobilising allies in the defence of knowledge claims.

Latour highlights that science is a collective process. If a scientist's claim is being ignored by all her colleagues, if no one reads the text which presents it and if no one, however distortingly, uses it, the scientist is isolated and her claims will not obtain the

status of a scientific fact. The social nature of the process of knowledge construction also means that the later use of the text is outside the control of the scientist.

The more people believe in a statement and use it as an unquestioned fact, as a *black box*, the more it undergoes transformations. It may even undergo a process which *Latour* calls *stylisation or erosion*, but which *Garfield* calls *obliteration by incorporation*,[4] that is, a scientist's work becomes so generic to the field, so integrated into its body of knowledge that people neglect to cite it explicitly. In a case where a knowledge claim is accepted, each successive paper takes the original sentence, for example, a chemical formula, as a fact, successively shortens its description, "encapsulates it", and in the end, drops the author's name.[k] It becomes tacit knowledge. This is the most successful case for a knowledge claim; it has been accepted as a matter of fact and belongs to the "ready made science".

Explaining empirical findings in citation studies

Latour's view of the role of references (citations) in scientific texts is related to a theory of construction of scientific knowledge, a process in which scientific controversies are settled and knowledge claims are turned into facts. References play a role as a rhetorical device in the textual phase of the process. References are not treated as an isolated phenomenon but as a feature which has a purpose and function in the advancement of knowledge claims. In Latour's theory, references are one of an array of means (resources) authors have to make literature more technical and to overcome opposition. As such, they are not central to this theory. However, in contrast to previous attempts at explaining citation, *Latour* is able to make understandable many empirical findings in citation content and context studies already referred to.

1. The heterogeneous usage of references. In spite of the fact that authors have different motives and different rhetorical reasons for inserting references into their texts, and these reasons vary from one reference to another in the same text, the general role of citations is uniform, that of supporting knowledge claims. The heterogeneity is indicative of the variety of means used to fulfil this function.

2. The difference between the intentions and interests of the authors of the cited and citing texts is being explained – knowledge construction is a *social* process and authors of texts cannot control the later usage of their texts.[m] The subsequent transformation of the cited texts in the process is an essential part of the social construction of scientific knowledge.

3. Different citation 'etiquettes' are understandable considering the primary function of citations as a rhetorical device and the fact that different groups of scientists might have different discourse practices.

Neglect by the bibliometric community

The Latourian views have been largely ignored by the bibliometric community in their discussions about citations. The reasons why this is so are intriguing. An important conceptual reason is presumably the fact that in Latourian theory, the major role of references is to support the knowledge claims of the citing author. This explanation does not legitimate major uses of citation indexing, its use as a performance measure – as in the use of citation counts which presupposes that references indicate a positive assessment of the cited document – or as an indication of the development of specialities – as in co-citation analysis. A theory of citations has to address and justify the major practices of the field and hopefully inspire new avenues of research. The Latourian notions would certainly open up new types of citation studies, but do not justify the former. By contrast the Mertonian view does. With regard to the use of citations as a performance measure, according to the Mertonian view, one might assert that more citations means more recognition. The latter is given to work that is regarded as being of significance for subsequent research.

Another reason, partly cognitive, partly social, is the deep gap between the research approaches of practitioners in bibliometrics on the one hand and social constructivism or other new analytical perspectives in the sociology of scientific knowledge on the other. In spite of great differences within the latter tradition, from the viewpoint of bibliometricians, Latour's statements merely fall within the same camp, no matter how many differing underlying assumptions there are within the group. There is little interaction between the bibliometricians and practitioners in the latter group, and it is quite likely that they remain ignorant of each other's contributions. A notable exception to the divide between two camps is actor-network theory as applied to co-word analysis by *Callon*, *Law*, and *Rip*,[14] to be dealt with in the next section. The existence of this counter example shows that neither the new analytical perspectives, nor the quantitative studies of science, have uniform standpoints and lines of thought, and being part of dynamic research fields, do not have stable standpoints.

The following is an illustration of the epistemological – even ontological – differences between the quantitative studies and some branches of the new analytical perspectives. In his most highly cited paper, *Edge*[15] emphasised the preferred logical status of qualitative methods, informal interactions and partial views of the participants

over a quantitative view. He opposed co-citation analysis on the basis that a speciality is "a social construct, a concept which allows actors to make transient sense of their experience, and to orient themselves accordingly", and though he expects some degree of agreement on its boundaries, there is no detailed consensus on them. According to *Edge*,[15] this makes the correct definition of a speciality, "computer-aided or otherwise", meaningless.[n] In a similar vein, *Woolgar*[16] has argued that 'quality' (influence, impact) is a social construct which "should feature as topic rather than resource". Both authors criticise citation analysis for taking "an inappropriately positivist and realist approach".[o] This criticism implies that bibliometricians should abandon their quantitative studies and concentrate on questioning their approaches. Even though this kind of self-reflexion is important and to be recommended, it undermines the basic assumptions of bibliometrics and would lead to an impasse from the bibliometricians' point of view. Bibliometricians are not likely to combine both realist and relativist points of view in the same study.

Potential new theoretical developments

The Mertonian notion of citations as reward has not been completely rejected in citation studies.[17] A reformulation of the Mertonian view was provided by *Cozzens* in 1989[18] when she presented a multi-dimensional model in which citations are at the intersection of three systems; citations are part of the reward system of science, "through which credit for achievements is allocated"; while, at the same time, they play a considerable role in the rhetorical (cognitive) system of science, "through which scientists try to persuade each other of their knowledge claims". The two systems are analytically disctinct, but concretely indistinguishable. This interpretation took into account new developments in social studies of science and empirical findings in citation content and context studies. *Cozzens* also mentioned a third system, the communication system of science, which plays a role in citation process. The last aspect has been elaborated by *Luukkonen*,[19] who paid attention to the publication system and its influence on the accumulation of citations. *Leydesdorff* and *Amsterdamska*[20] have made a further contribution in this direction by drawing attention to the fact that citation analysts make undue translations between the cognitive and social dimensions. They attempted to clarify the distinction by drawing attention to the authors on the one hand and to the texts on the other hand and by devising a typology based on the various combinations of citing and cited texts and authors. The more textual the relationship, the more cognitive it was.

The multidimensional approach which emphasises the analytical distinctiveness of the dimensions of citation has been an attempt to save citation studies from the critique and implications of the new sociology of science in particular; both *Merton* and *Latour* might be right, citations can be both reward and a rhetorical device. The multidimensional approach has shown that it has taken aboard the criticism presented and provides a serious defense of the citation analysis. Still, it has not been able to provide a novel and inspiring view of the citation process. In research practice, it provides little guidance as to how to interpret the multidimensional data.

Another new direction is found in the new analytical perspectives. As mentioned earlier, not all of them abandon quantitative approaches. Most notable is actor-network theory as applied by *Callon*, *Law* and *Rip*[14] to co-word analysis. Their co-word analysis summarises articles in terms of associations of words which signal networks of problematisations. These enable researchers to trace "successful translations of actor-worlds", "enrolment" (drawing in) of others by the actors for the support of their purposes and projects in the process of construction of scientific facts. According to them, counting associations adds to the analysis: "A count of the number of times that an association is repeated is a check on the solidity of the actor-world and its associations." According to them, quantification is essential for tracing the relationships between the world of researchers and the world of industry or consumers.

This research perspective, actor-network theory, might (be enrolled to) provide a theoretical foundation for co-citation analysis, too, following the suggestion by *Small*[21] that frequently cited documents are taken as concept symbols and that citations can serve as a kind of language system. This idea was among the founding objectives of *Garfield* who originally thought that cited articles are analogous to subject terms.[12] The application of the actor-network theory to co-citation analysis might imply that frequently co-cited articles and their associations are networks of problematisations comparable to co-occurrances of words. They can be interpreted as translations (propagations) of interests by citing scientists and as stabilisations of controversies, as standard definitions of problems. The development of citation theory in the direction of actor-network theory would imply going back to its roots and making a new start in a different direction from previously.

Would this direction be compatible with the social practices of citation analysis and in particular its use in evaluation and as a performance measure? It is possible. It is conceivable that citation counts, not only co-citations, could be interpreted as an indication of the success of the cited authors in being incorporated in actor-networks, and thus, as some sort of a measure of social success. The concept of *social success* in enrolment of support would be central for the interpretation of the meaning of citations

and for explaining the use of citation analysis in evaluation, in particular. It would follow from this new direction that citation analysis would be applicable only to highly cited publications. This seems reasonable taking into account that small differences in citation counts could be artefacts of intervening factors or technical errors or the equivalent. This interpretation, however, needs to be further elaborated.

In accordance with its starting point, this line of reasoning blurs the social and cognitive dimensions of citing in contrast with the point by, in particular, *Leydesdorff* and *Amsterdamska.*[20] It does not attempt to make a distinction between the dimensions which are in practice intertwined. It may even be criticised because it takes the argument too far and by emphasizing 'social success' reduces citing, and with it, scientific argumentation, to a social activity only. The same criticism can in fact be addressed to the Mertonian notions. An answer to this criticism might be that, because of the mixed nature of the things to be described, an overemphasis in one direction or another may be unavoidable. Any theoretical formulation will simplify the processes it describes by drawing attention to their essential features.

Conclusions

Latour's theory of citation is cognitively the most ambitious attempt in recent decades to create a new sociological theory of citation. It is able to make understandable many empirical findings in citation studies and is superior to the Mertonian sociology in this respect. Nevertheless, it has not been accepted by the bibliometric community pursuing citation studies. This paper offers two major reasons for this. The first is the fact that Latourian notions do not support the major research practices in the field of citation studies. Another reason is related to the cognitive (epistemological, in some cases even ontological) differences between quantitative studies of science and new analytical perspectives in the sociology of science, and their subsequent social distance.

A reformulation of the Mertonian view of citations, provided by the multidimensional approach and first introduced by *Cozzens* provides an attempt by the citation community to legitimate their research practices cognitively and socially. It is an answer to criticism presented by the empirical citation content and context studies on the one hand and the relativist and linguistic turn of social studies of science on the other hand. Being a defensive formulation, it does not offer a genuinely novel view of citation. A new and promising direction for the sociological theory of citation would be a third alternative which draws on the concept of social success and on elaboration of the actor-network theory as expounded by co-word analysis. It would legitimate social

practices of citation analysis and serve as a bridge between the quantitative and qualitative approaches.

Notes and comments

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[a] This paper focuses on sociological interpretations of citations and, in particular, on discussing why one particular interpretation has been neglected. Because of this limited starting point, it does not attempt to discuss the more natural science based interpretations such as that by de Solla *Price,*[22] or for example communications systems approach by *Leydesdorff.*[23]

[b] According to the formulation by Merton,[3] citations are, in their cognitive aspect, "designed to provide the historical lineage of knowledge and to guide readers of new work to sources they may want to check or draw upon themselves. In their moral aspect, they are designed to repay intellectual debts in the only form in which this can be done: through open acknowledgement of them."

[c] For example by *Mulkay,*[24] who criticised Mertonian ethos and norms on the ground that norms do not guide the actions of scientists in the way *Merton* described and that 'cognitive and technical norms' are a more realistic constraint on scientists' behaviour than social norms. *Mitroff*[25] presented counternorms, and *Latour* and *Woolgar* whose book, first published in 1979, criticised Mertonian sociology for the fact that it ignored the scientific and technical content of science. See *Latour, Woolgar.*[26] Kuhn's concept of paradigm, first presented in 1962, also had significant influence on the development of sociology of science and drew attention to the technical contents of science.[27] For an account of the development of new analytical perspectives in social studies of science, see *Knorr-Cetina, Mulkay.*[28]

[d] Good summaries of such studies are provided by *Small*[12] and by *Cronin.*[13]

[e] Garfield's letter to de Solla *Price* in 1962 complained of attempts by government people "of trying to use some of our data for evaluating, quantitatively, the significance of certain research", of which Garfield was "fearful".[29] *Bayer and Folger* published a study which correlated scientists' citation performance with the rank of their graduate schools as early as 1966, see *Narin.*[6] Narin's review listed 24 studies which compared bibliometric (partly publication counts, partly citation counts) with non-bibliometric measures of performance. *Narin* coined the name 'evaluative bibliometrics' for this branch of bibliometrics. In its early phases, such studies were mainly carried out as academic exercises and for cognitive interests (e.g. *Cole, Cole*[5]).

[f] *Latour,*[1] p. 36, 38.

[g] When analysing the role of references, Latour's metaphors are military. See note i, in particular. On page 172,[1] *Latour* explains his use of military metaphors by the close connection between science and the army: "... technoscience is part of a war machine", and "no army is able to win without scientists, and only very few scientists and engineers are able to win their arguments without the army". *Latour* uses other metaphors in his book. He refers to Machiavelli's *Prince* several times when speaking about the machinations needed to enrol others in the construction of 'facts' or 'objects', for example, ibid., pages 124 and 128–129. His actor-network theory could justifiably be called Machiavellian.

[h] *Latour,*[1] p.48.

[i] In Latour's military jargon: "Do whatever you need to the former literature to render it as helpful as possible for the claims you are going to make. .. weaken your enemies, paralyse those you cannot weaken,

help your allies if they are attacked, ensure safe communications with those who supply you with indisputable instruments, oblige your enemies to fight one another; if you are not sure of winning, be humble and understate", p. 37–38.

[j] *Latour,*[1] p. 40.

[k] *Latour,*[1] p. 42–43.

[m] *Latour,*[1] p. 40.

[n] *Edge,*[15] p.123–124.

[o] *Edge,*[15] p.108.

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