

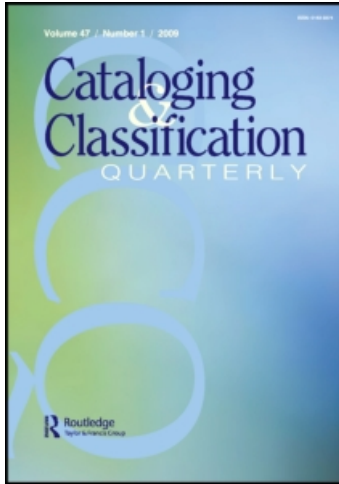
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## THE INTERNATIONAL OBSERVER

### **It's about Time!: Temporal Aspects of Metadata Management in the Work of Isabelle Boydens**

DAVID BADE

*Column Editor*

One of the principle emphases in Roy Harris's writings on language and communication is the element of time in communicative action. According to Erik Hollnagel, one of the critical features of all work is the temporal dimension. Both the cognitive psychologist Dietrich Dörner and the professor of management Guy Callender found that a failure to consider temporal developments was characteristic of managers whose decision making produced catastrophic failures in simulated (Dörner) and real (Callender) situations. The temporal dimensions of database construction, management, and use have been a matter of frequent reflection on my part, but I have never pursued the issue in any depth (not enough time, perhaps). Nor do I recall running across any sustained discussion of the issue in the literature of library and information science during my searching over the past decade. Clearly my failure, as Isabelle Boydens' 1999 book *Informatique, normes et temps* proves. My only excuse is that searching EBSCO's *Library, Information Science & Technology Abstracts with Full Text*, Wilson's *Library Literature and Information Science Retrospective*, and LISA (CSA Illumina)—all of them—today (January 26, 2011) turns up not a single reference to Boydens.<sup>1</sup> That is shocking, so shocking in fact that someone ought to find out what it is these databases are doing and why a prolific author like Boydens is not in any of them. Her book is in OCLC WorldCat, but only two U.S. libraries were listed as having copies. That is all the justification I need for this issue's column, and indeed, for *The International Observer* column itself.

Like Carlo Revelli's work discussed in the last *International Observer* column, the number of Boydens' publications and the length of *Informatique, normes et temps* presents just too much to go through in detail. At times the level of technical detail goes over my head, and at other times I had difficulty imagining how this would translate into cataloging practice (i.e., my world) as opposed to database management efforts by programmers (definitely not my world). Yet even in what were for me the heaviest sections of her monograph, the synthesis at the end of each chapter (a very

nice feature of her book) invariably increased my level of understanding and led me to some heavy underlining. Rather than a detailed review of twenty years of publications, I shall comment on a few themes in her major work *Informatique, normes et temps* that particularly interested me, and follow that with comments on some of her other publications as well as those of her former student Seth van Hooland.

Before discussing some of the particulars of her published work (chiefly in French, but a few papers in English), I would like to mention two notable characteristics of her writing. First of all, in spite of the technical topic, her writing is easy to read and understand. In many academic papers every statement is justified by one, two, or ten references that are then either never discussed, or when discussed at all, the discussion only proves that the authors did not really read the works cited. Other authors insist on filling half the book with quotations and the other half with footnotes (the pot is calling the kettle black here and he is well aware of it). Readers of Isabelle Boydens' book will suffer none of these horrors. References, quotations, and footnotes are neither obtrusive nor excessive, and are always pertinent, with their importance for the argument made clear in the discussion that follows. One might think this is just a matter of style, but good writing like hers is generally the product of clear thinking, and that is the second characteristic to note.

When Boydens mentions or quotes Raymond Aron, Fernand Braudel, Norbert Elias, Gilbert Hottois, Friedrich Nietzsche, Max Weber, or Ludwig Wittgenstein (which she does), the reference is presented as the basis for a discussion that takes those remarks and elaborates what they mean for database management. Not only information scientists but philosophers, sociologists, and historians inform her discussion—they do not merely embellish it. Theories developed outside of information science and long before its origins inform her work, principally hermeneutics and historical criticism. Her discussion of metadata (she uses the term “méta-information” and has been publishing on the topic since 1993) in the third chapter of *Informatique, normes et temps* (“Bases de données et incertitude”) is a good example of how the depth of her analysis is rooted in theories and concepts that have been developed outside Library and Information Science (LIS). If one compares her discussion of metadata with the widely acclaimed works of philosopher and metadata advocate David Weinberger, the latter comes off as Timothy Leary to Boydens' Edmund Husserl. Her “méta-information” is neither everything (and therefore nothing) nor miscellaneous (and therefore meaningless) but theoretically introduced in the chapter on the problem of uncertainty in databases. With a notion of metadata rigorously and theoretically defined in its philosophical, social, and technical significance, she clarifies many issues that plague metadata managers and is able on that theoretical basis to proceed toward the development of automated methods for managing particularly difficult problems.

The chief issue she addresses in her book appears to be simple enough. Time, she insists, is a part of the real world that must be taken into consideration by database managers from the very beginning. The problem? The world changes, whether the data that we utilize in our decision making regarding that real world does or not. Her metadata is, therefore, not just meta- as in higher generalization (metaphysics), but meta- as in change (metamorphosis). Her book is, however, more than just a treatise on information science the author of which had more time on her hands than most. The preface is a very good indication of the diversity of approaches she takes to database management as well as the multiple means for addressing the problems of temporal databases. In that preface four authors address the four principle dialogues that inform her monograph. In her book information science confronts public administration and management (Alain Pirotte), hermeneutics (Françoise D'Hautcourt), history (Jean-Philippe Genet), and epistemology (Jean-Louis Besson). That was more than enough to propel me through the next 550 pages.

After a general introduction to the problem that her book addresses and the structure of her argument, the first three chapters present the state of the art in research on how to evaluate and improve the quality of databases. Included is a discussion and marvelous critique of the MIT "data quality management" research program of the early 1990s, a discussion of current methods of managing data quality, and the problem of uncertainty which was at the heart of her critique of that research: "the question of the accuracy of a database can find no satisfactory response because of the absence of referentiality that would allow the validation of the adequacy of the information [in the database] to the real world it represents." Uncertainty, she notes, "designates that which is neither fixed nor determined *a priori*."

For operational reasons, most current database models rest on the hypothesis of a closed world: all the facts not included in the database are interpreted as false. Theoretically, a database is thus considered as complete (all the values logically deriving from a given state of the database are present) and coherent (all the present values are correct), inside the area specified by the schema of the database. Nevertheless, in practice databases come to have incomplete or incoherent values.<sup>2</sup>

And how do databases come to have incomplete or incoherent values? Time changes the world that the data must accurately reflect if the database is to be useful at all. Time also changes the database structures, schema, and sources of data, as well as the social forces that determine what information needs to be in the database, for example, database users' desiderata and legislation, as well as discoveries and inventions, all of which may make all-important what was previously insignificant (and vice versa).

One of Boydens' chief arguments concerns the limitations of the TDQM (Total Data Quality Management) approach associated with Redman, Wang, and MIT in the 1990s. She begins her critique by noting that the solutions proposed by these researchers "has as its object the improvement of procedures for treating the inadequacy of formally identifiable and measurable errors (incoherencies, incompleteness, programming errors)."<sup>3</sup> Boydens reminds the reader that beyond such formal errors there is a particularly important matter that TDQM approaches to data quality do not address at all, and that is the human interpretation of information.

The measure of the accuracy of a fact rests upon a hypothetical bijective relation between a value  $v$  contained in the database and the corresponding true value  $v'$ . Yet because of the absence of referentiality in any empirical domain of application, what these authors call the "correct value  $v$ " is in absolute terms "unknowable". For example, to verify the validity of the name of a salaried worker presupposes that one has available a precise and determinate definition of the concept of "salaried worker". Yet, the juridical and informatic norms that permit the representation of the concept, exactly like the real world alongside it, never cease to evolve. . . . *A fortiori*, to verify the validity of the names of several hundreds of thousands of individuals supposes that one can identify the whole of the population at every moment."<sup>4</sup>

She proceeds to outline the "ontological foundations" set forth in a famous paper by Wand and Wang<sup>5</sup> and three postulates upon which those foundations rest:

The world is composed of discrete, unequivocal elements that are clearly identifiable and perceptible;  
 Combinations and knowledge of these elements are governed by laws;  
 It is possible to establish a bijective relation between the observable reality and its informational representation by virtue of the isomorphism that links the one to the other.<sup>6</sup>

Her critique begins simply enough: "Wand and Wang's approach is tautological."<sup>7</sup> Ockham gets the credit for refuting Wand and Wang's logic seven centuries ago, and Gilbert Hottois leads her to the observation that "the absence of a 'contradictory' observation is not sufficient to prove the validity of a proposition but only a temporary indication."<sup>8</sup>

She then develops an argument on the basis of census databases, the semantics of which are, she insists, "precisely characterised by the absence of any isomorphism with the corresponding reality and that for three reasons."<sup>9</sup> First, a census can never be complete. Second, the evaluation of census data can never rest on the available sources. And finally all economic and statistical observations are artificially attributed to a given period of time

when in fact there is always of necessity a discrepancy between the state of the real world and its measurement.<sup>10</sup> A few pages later she quotes Stuart Madnick:

There are often real reasons why different people, different societies, different countries, different functions, different organizations may look at the same picture and see something different. To assume that this can be prevented is a mistake. We must accept the fact that there is diversity in the world.<sup>11</sup>

Boydens herself goes further, arguing that “even in the case of a single fact and of a single observer, an unequivocal informational representation of ‘observable reality’ is illusory.”<sup>12</sup> This leads her to suggest in the final sentence of the first chapter that the question TDQM researchers asked—Is the information contained in the database correct?—should be replaced by the question “How is information constructed over time?” This change in the question we ask of databases is itself a splendid example of her thesis and the reason for the new question: the world changes *for us* because we ask and expect different things of it at different times; that being so, both our data and our metadata need to change to reflect that new state of the world. This is quite a strong claim, namely that neither data nor metadata have some ontological status that remains unchanged regardless of the user, the uses, and the questions that ground each use of the database.

As mentioned earlier, chapter three theoretically puts metadata in its place: the management of uncertainty and change. Boydens argues that systems of metadata should be constructed on the basis of four tasks: the identification of a minimal group of metadata based on usage, a compromise between economy and completeness of information, assessment of the organization within which the metadata will function, and an effort at minimizing manual labor.<sup>13</sup> It is preferable, she insists, “to forego schema enrichment rather than adding elements” if the organization lacks the human resources that updating such metadata would require, since the provision of partial or dubious metadata would be “a remedy worse than the problem being addressed.”<sup>14</sup> The validity of probabilistic or “fuzzy” indexing in a real—and therefore uncertain—environment is liable to be even more uncertain than the original uncertainty of the real it is intended to represent.<sup>15</sup>

The third part of the book describes the database that the author studied, the Belgian social security database (LATG), and the principle methodologies informing her approach: heuristics, historical criticism, and hermeneutics. Historians, like database users, “confront the absence of referentiality”

In order to verify the correctness of some value, one must have available a normative reference. Yet, in an empirical domain of application, that

reference does not exist. . . . In order to verify the correctness of the information contained in a database, one must ideally know *a priori* a reality that only that database allows one to know.<sup>16</sup>

For the historian, the past is past and inaccessible directly, while in a database, each item of information it contains reflects a different past state of affairs that has changed since the effort of data collection. This remains true even in a “live” system; the only difference being the shorter time interval between data capture and data use. The opacity of a networked system decreases as the capacity of access increases, yet

from node to node, from context to context, information is transformed in the act of circulating. And the user, further and further from the source producing the information, does not necessarily have the resources that would allow him to decode the meaning of the data obtained.<sup>17</sup>

Any information scientist who cites the Belgian philosopher Gilbert Hottois—and Boydens does—gets my attention, but anyone who quotes the British philosopher Robin George Collingwood not only gets my attention but gives me great pleasure. In her chapter on hermeneutics for databases, we get to read Collingwood’s own words in French translation:

Data, on the one hand, and principles of interpretation on the other, are the two elements of all historical thought. But they do not exist separately and then undergo a combination. They exist together or not at all.<sup>18</sup>

She follows this with the remark “the interpretation of the same concept varies according to the place, the period, the context and even the author. Scientific questions themselves have their own histories.”<sup>19</sup> This issue is further elucidated in the sections entitled “The interpretation of the norm interacts with interpretations of the facts”<sup>20</sup> and “The interpretation of the facts interacts with that of the norm.”<sup>21</sup> With her introduction of Braudel’s notion of time levels and Elias’s evolutive continuums, we have entered into the heart of the problem that she addresses and her approach to dealing with that problem.

That is a very brief summary of the first two parts/six chapters of Boydens’ book. The remaining sections deal with the management of the flow and change of data, proposed methods for automating as much of that effort as possible, and general conclusions. In this book and in subsequent publications Boydens illustrates “how hermeneutics, embodied through the use of a temporal framework, can help to interpret changes in the quality of empirical databases and lead the way to operational recommendations.”<sup>22</sup> The management strategies described in her publications apply “to all

information systems whose structure evolves according to the interpretation of the realities that they aim to grasp. This is particularly true of empirical databases, in which the homogeneity of the formal codifications clashes with the heterogeneity of the empirical categories.”<sup>23</sup>

One of the most interesting aspects of studying the LATG database was that the data really mattered, mattered to the people affected (pensioners, the unemployed), and to the responsible administrative agencies. National and international legal regimes enforced both the collection of the data and its interpretation in a never-ending and frequently retrospective sequence of changing and sometimes conflicting laws. To construct and manage a database that really matters requires a very different mindset than that frequently encountered in the library literature. Related to that is another matter that I should have noted myself, and long ago, but never have: database quality is not only a matter of human knowledge, ignorance and error, nor of human error directed and exacerbated by bad policies, rather it is above all a matter of the very structure of existence in time. It is that insight that has informed Boydens’ work since the early 1990s, and the implications of which are now being pursued not only by Boydens herself, but also by some of her present and former students. A few remarks on that growing body of research follow.

Many of the themes treated in depth in *Informatique, normes et temps* were discussed in a few earlier papers that may be easier to find and to read than the monograph. Using historical criticism to think about database management was the topic of two early papers “Informatique et qualité de l’information. Application de la critique historique à l’étude des informations issues de bases de données” (1993) and “La critique historique face aux sources informatiques” (1996).<sup>24</sup> Metadata was the topic of a few papers of the late 1990s and the past decade.<sup>25</sup> Managing data transformation and data quality over time were the particular concerns of three papers in 1998,<sup>26</sup> although this is really the basic concern in all of her published work. Since the publication of her monograph in 1999, Boydens has touched on topics such as controlled vocabulary,<sup>27</sup> the conflict between the disorder in the real world and the order constructed within a database,<sup>28</sup> Web2.0,<sup>29</sup> and the Semantic Web.<sup>30</sup>

A number of recent papers in English present in concise and updated form both the theoretical approach and the operational strategies that she has developed during the past decade. Her latest paper describes the use of her approach to data quality in electronic government in Belgium. In E-government databases “the pooling of data and dematerialization of procedures demands interoperability between sectors and departments, and this potentially multiplies the interpretation difficulties to be overcome.”<sup>31</sup> She describes the three methods developed for dealing with these problems in Belgian government databases:

1. *Master Data Management* is a general methodology to analyze and improve the quality of the concepts and flows judged to be the most fundamental within the information system.
2. *Anomalies and Management Strategies* are an original operational approach that we applied in the scope of our research about interpretation of the Belgian social security database.
3. *Documentation of Application and Services* aims to present an electronic data dictionary (glossaires de la sécurité sociale) that was implemented in Belgium to improve interpretation of e-government databases by the Belgian Data Quality Competency Center presented in the introduction.<sup>32</sup>

“Hermeneutics applied to the quality of empirical databases” (with Seth Van Hooland) is a short but comprehensive introduction in English to Boydens’s approach to database management,<sup>33</sup> and a forthcoming paper coauthored with Van Hooland and Eva Méndez Rodríguez, also in English, is a very interesting and iconoclastic empirical study of user-generated metadata in cultural heritage institutions.<sup>34</sup> In this latter paper the authors note that studies of user-generated metadata in Web2.0 environments have focused on the usefulness and efficacy of such metadata for current users, but the authors are particularly interested in other questions, namely the responsibility of cultural heritage institutions towards the past we are preserving and future uses of those materials. (It is amazing how differently we can evaluate a practice depending on the questions we ask of it!) In a 2010 paper she describes centralized/hierarchical and distributed/anarchic systems of knowledge organization in the Western world from the medieval era to our own.<sup>35</sup>

Two of the papers mentioned above were written in collaboration with Seth van Hooland, current holder of the chair in Digital Information at the Information and Communication Science department of the Université Libre de Bruxelles and a former student of Boydens. One of the major topics that van Hooland has researched is the changing nature of description and the role of changing technologies and government policies in that development. That is one of the central issues discussed in his thesis<sup>36</sup> and in personal communication he has indicated that he is working on a paper looking at the successive records created for a single object over the past 150 years, in collaboration with museums and libraries in Brussels and Berlin. His paper (in Dutch) on the history of metadata looks at how successive technologies bring us different kinds of metadata and consequently different possibilities, from the card catalogue to Web2.0.<sup>37</sup> Other papers in English and French deal with metadata, folksonomies, and ontologies in museum collection databases.<sup>38</sup>

I am just beginning to think about the philosophical and practical implications of taking time seriously when thinking about databases and in using them. Boydens and Van Hooland have given me much to consider along those lines. But they are not armchair philosophers: they both really understand the nuts and bolts of information technologies and their intention

is not only to understand how metadata works, the limitations and possibilities that metadata (however produced) offers to users of databases, but also how to ameliorate the limitations and enhance the possibilities through operationalizing metadata management. That is where they go way beyond anything I have done or ever will do.

It is not often that anyone manages to open up a whole new dimension to any field, but by bringing research into the problems and questions associated with heuristics, hermeneutics, and the study of history, Boydens has not only broken new ground in approaches to database management, but opens up an entirely new dimension of reflection on cataloging and classification. Those whose interest veers toward the philosophical questions associated with cataloging and classification will find Boydens' publications, from the first paper to the forthcoming, among the most interesting research produced during the last few decades.

\* \* \* \*

The next column now in preparation will be devoted to the work of a number of French anthropologists and information scientists who have been studying the adoption, adaptation of, and the use, misuse, abuse, and sometimes rejection and disuse of new technologies in airline cockpits, museums, and of course libraries: Victor Scardigli, Joëlle Le Marec, Sophie Deshayes, Emmanuel Souchier, and Yves Jeanneret. Suggestions, material for discussion, and inquiries for writing as guest editor should be directed to:

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## NOTES

1. For a complete list of Prof. Boydens' publications see her Web page: <http://www.ulb.ac.be/cours/iboydens/>
2. Isabelle Boydens, *Informatique, normes et temps* (Bruxelles: Bruylant, 1999), 100.
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4. *Ibid.*, 58.
5. Yair Wand and Richard Y. Wang, "Anchoring Data Quality Dimensions in Ontological Foundations," *Communications of the ACM* 39, no. 11 (November 1996): 86–95.
6. Boydens, *Informatique, normes et temps*, 62.
7. *Ibid.*, 63.
8. *Ibid.*, 64.
9. *Ibid.*, 65.
10. *Ibid.*, 65–66.
11. Madnick, quoted in Boydens, *ibid.*, 68.
12. *Ibid.*, 68.
13. *Ibid.*, 117.

14. Ibid.
15. Ibid., 118.
16. Ibid., 144.
17. Ibid., 152.
18. Collingwood, from *The Philosophy of History* (London: Published for the Historical Association by G. Bell and Sons, 1930), quoted by Boydens, *ibid.*, 161.
19. Boydens, *ibid.*, 161.
20. Ibid., 163.
21. Ibid., 164.
22. Isabelle Boydens and Seth van Hooland, "Hermeneutics Applied to the Quality of Empirical Databases," *Journal of Documentation* 67, no. 2 (2011): 287.
23. Ibid.
24. Isabelle Boydens, "Informatique et qualité de l'information. Application de la critique historique à l'étude des informations issues de bases de données," *Belgisch Tijdschrift voor Nieuwste Geschiedenis. Revue belge d'histoire contemporaine*, vol. 3–4 (1993): 399–439; Isabelle Boydens, "La critique historique face aux sources informatiques," in *Actes de la Journée de l'histoire contemporaine 1996—session "Internet pour les historiens"—Vereniging voor Geschiedenis en Informatica (VGI). Université Catholique de Louvain-La-Neuve, 27 April 1996*: 15–17.
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38. Seth van Hooland, “Spectator Becomes Annotator: Possibilities Offered by User-Generated Metadata for Image Databases.” Paper presented at *Immaculate Catalogues: Taxonomy, Metadata and Resource Discovery in the 21st Century*, September 13–15, 2006, University of East Anglia, UK. <http://homepages.ulb.ac.be/~svhoolan/Usergeneratedmetadata.pdf>; Seth van Hooland, “Entre formalisation et déconstruction: état de l’art critique de l’application documentaire des ontologies et folksonomies dans le domaine de l’indexation du patrimoine culturel numérique,” in *Organisation des connaissances et société des savoirs: Concepts, usages, acteurs. Actes du colloque ISKO 2007, Université Paul Sabatier IUT, Toulouse, 7 and 8 June 2007* (Toulouse, 2007): 33–47; Seth van Hooland, Yves Bontemps, and Seth Kaufman, “Answering the Call for More Accountability: Applying Data Profiling to Museum Metadata,” in *Proceedings of the International Conference on Dublin Core and Metadata Applications, 22–26 September 2008, Berlin* (Berlin: Dublin Core Metadata Initiative, 2008): 93–103.