

Managing Extended Organizations and Data Governance

Eric Buffenoir and Isabelle Bourdon

Abstract. These last years, main IT companies have build software solutions and change management plans promoting data quality management within organizations concerned by the enhancement of their business intelligence system. These offers are closely similar data governance schemes based on a common paradigm called Master Data Management. These schemes appear generally inappropriate to the context of complex extended organizations. On the other hand, the community-based data governance schemes have shown their own efficiency to contribute to the reliability of data in digital social networks, as well as their ability to meet user expectations. After a brief analysis of the very specific constraints weighting on extended organization's data governance, and of peculiarities of monitoring and regulatory processes associated to management control and IT within these, we propose a new scheme inspired by Foucauldian analysis on governmentality: the Panopticon data governance paradigm.

Keywords: Data Quality Management, Information System Design, MDM, Community, Panopticon.

Introduction

Ten years ago, TDWI (The Data Warehousing Institute) estimated at \$ 600 billion the cost of erroneous data in business sector. In fact, data quality control within an organization is a key requirement for the implementation of management control

Eric Buffenoir
UMR 5221 CNRS, Montpellier, France
e-mail: buffenoir.eric@gmail.com

Isabelle Bourdon
Montpellier Research Management, Montpellier University 2, Montpellier, France
e-mail: isabelle.bourdon.pro@gmail.com

and business intelligence. This question is all the more significant in the extended and complex organizations where differentiation between actors and organizational methods, as well as importance of external influences, strongly constrain the methods adopted to ensure consistency of standards and processes. To deal with issues of data governance, there are currently two major paradigms: Master Data Management and Community Management. The first occupies a market estimated by Gartner to \$ 1.9 billion in 2012, up 21% compared to 2011 and 3.2 billion in 2015, and it is difficult to overestimate the markets covered by data quality management inherited from digital social networks.

After defining the global characters of extended organizations and clarified the specific issues of their data governance schemes, as well as the nature of the monitoring and control processes encompassed by the deployment of such governance, we address the legitimacy of existing paradigms (MDM and Community) in this context, and suggest guidelines for the development of a new data governance paradigm, better suited to the specific challenges addressed by extended organizations.

1 Data Management Issues in Extended Organizations

1.1 Extended Management, Information Systems and Data Management Issues

The notion of extended organization (1, 2) is characterized by the existence of multiple relationships with external partners, the delicate definition of its organizational boundaries, which become very porous, tremendous complexity of the causal dynamics in their inner evolutions, as well as nested control processes linking their various entities. Structural differentiation within extended organizations creates a peculiar need for extensive integration of their activities, which can be fulfilled by the development of transverse mechanisms and tools, crossing hierarchical chains and control, and development of multiple control channels for any process (3, 4). The importance of networks in the development of cross-integration mechanisms may be preeminent over organization's hierarchical controls, due to the possible weakness of this hierarchical power on actors involved in these networks, as being exposed to strong external influences or motivated by their own interests (5).

Deployment of IT puts data, their collation, processing, dissemination and quality (6, 7) issues at the heart of operational management control and decision-making activities (8). Data governance scheme offers a framework for the definition, distribution, synchronization and exchange of reference values for Master Data (9). These data are generally stored in a single place of reference, which remains in access by different applications, and: allows their creation or modification by different actors of the organization, ensures its consistent use by various operational applications, fixes a set of quality standards, facilitates the adaptation to changes of usage patterns, allows the construction of relationships between

heterogeneous Master Data for decision-making processes. The implementation of a data governance scheme necessitates (9): semantic alignment between domains, clarification of concepts and identification of business glossaries, precise definition of business processes, identification of control authorities, roles and responsibilities.

We believe that the very nature of extended organizations imposes a set of technical and organizational constraints on the chosen paradigm of data governance and on the considered IS architecture, reflecting a strong incentive for decentralization of control processes over Master Data, although this decentralization may take different forms (10).

- The inherent complexity of extended organizations results in a singular complexity and a wide spectrum of Master Data, reflecting the diversity of actors, missions and organization modes for its subunits. Data governance must promote deconcentration (10) to respect the jurisdiction of actors, and multiplication / diversification of control channels on a same data set.
- Some communities within the extended organization may prefer to use their proper IS. Other inter- or trans-organizational communities may prefer integrate themselves in data governance schemes held by partner organizations and relying on their own IS tools, rather than adopting the tools and integrate the scheme coordinated by the extended organization. Hence, the pattern of data governance held by the extended organization must allow the decentralization of a significant part of control processes towards these communities and partner organizations. Considered decentralization is conceived in terms of functional decentralization or delegation (10), based on the contractual relationship between the organization and its partners, rather than in its most extreme form of devolution (10).
- Certain business processes encompassed by the data governance scheme of the extended organization inevitably involve numerous actors favouring the relations they have woven within networks over the hierarchical controls of the extended organization. The limited efficiency of these control processes does not mean the lack of normative communication concerning the quality of data among the users of these data, but rather a lack of formalization of these processes through tools, standards and processes that underpin the organization's data governance framework. This formalization may be based on the development of digital social networks and their integration in the pattern of data governance.
- Importance of external influences on the activities and resources of the extended organization constrains it to adopt standards for its data repositories that are prepared to the confrontation with the information harvested from relevant external data sources. The lack of control by the organization on IS tools used by the external data sources, imposes a systematic implementation of dictionaries between organization's Master Data and data coming from external sources.

The development of a data governance paradigm, suitable for extended organizations, raises the question of the precise nature of nested control and regulation mechanisms inherent in the use, the share and the management of data.

1.2 *The Panopticon Paradigm for Data Governance*

The study of monitoring and regulation mechanisms underlying management control systems and information systems has been the subject of an abundant literature. The coexistence of centralized control and empowerment of actors has been analysed in studies on control processes underlying the ERP's implementation (11, 12). These studies pointed the proximity of these mechanisms and those of the ideal control paradigm, represented by the Panopticon architecture, devised by Jeremy Bentham (13) and developed by Michel Foucault (14). In this diagram, the actor, placed in a permanent and omnipresent area of visibility, is fed continuously to act as if he was being surveilled, and is led to integrate the norms and discipline. Too rapidly identified with a regime of generalized coercion system imposed by a central authority, the panopticism is quite different from living "within a disciplinary system" (14). The panopticism is a power that does not need to manifest itself physically, to become effective, it is a "machinery that assures dissymmetry, disequilibrium, difference. Consequently, it does not matter who exercises power. Any individual, taken almost at random, can operate the machine" (14), "the Panopticon is the formula of liberal *governmentality*", this governance lies in "structuring the *field of action* of any individual by every possible ways to influence *representations*, which will play a role in the calculation of their *interests*", by acting on "*monitoring interfaces*" (15, 16). The data governance paradigm within extended organizations is intended to make the considered organization a social and informational space, subject to omnipresent gaze and regulatory mechanisms. Starting in the late 80s, it was recognized how the work on Information Systems and management control ignored issues of power and conflict within organizations, and treated organizations as unified entities whose objectives are well defined and widely accepted (17). Resistance to the deployment of control processes underlying ERP within extended organizations has recently been analysed along the singular methodological approach adopted by Michel Foucault (18–20). Michel Foucault's perspective encourages to refuse the standard IS perspectives leading to analyse how the norms and the data governance scheme promoted within an organization may be legitimated and reinforced, or rather totally changed for another ones. It stands a critical method to analyse the *transformation* of control processes, which disregards schemes/institutions and the rational discourse on their own, in two ways : it privileges the study of elementary underlying disciplinary mechanisms and their articulation/discrepancy with the discursive practices (21), it also suggests to transcend the institutional standpoint and distinguish : the rationality/purpose of the institutionalizing scheme, the eventually unanticipated effects of it, the positive usage of these effects, and the formalization of a new rationality/purpose made possible by this usage and absorbing it (22). Foucault refuses to consider *institutions* as being primitive objects, fixed prior to any considerations at the same time than the collective body of individuals and their

governing rules. *Institutions* are considered as focal points for the concentration of these control technologies and the production of norms, which are immediately generalized to the whole social body and circulate throughout a network woven between them, the *subject* resulting from a multiplicity of *subjugation arrangements* within them.

It is tempting to reduce Information Technologies to a global realization of the Panopticon control technology, considering the working and living environment of each individual as a space of absolute visibility for their activities (23, 24), and to analyse the peculiar role played by visibility, transparency and accountability of actors in the deployment of new forms of control mechanisms permitted by IT within organizations (25–27) through the conceptual framework offered by Foucault. However, the isolation of the individual at the heart of the Panopticon, which makes of him “the object of information, never the subject of communication” (14), is not that of the individual placed within *area of visibility* created by organization’s Information System. The development of *social networks* makes him an actor of transverse communications, eventually diverting information, originally devoted to institutional control, for the purpose of strengthening the resistance of individuals to central authority (28). Incidentally, the use of foucauldian analysis for data governance paradigms study relies on a shift of the standard viewpoint concerning Information Systems. These studies are focusing on *institutions* in their specific ability to fix individuals in “a place and a collective body there is no way to leave” (29). To our point of view, this perspective leads naturally to translate foucauldian analysis on *institutions* for the purpose of analysing control processes promoted through Information Systems. Indeed, the very nature of information technology is to associate to objects or individuals their *digital dual* or avatar, registered in databases to proceed prescribed analysis and data matching between heterogeneous data (30–32). The construction of basic business processes within the organization depends so critically on the form chosen for these digital *representations*, that the decision to develop control processes, as well as fields and methods of this control, prove to be consequences of the choice of standards and IS tools within the organization (33). The digital dual is obediently and indefinitely usable for simulations coordinated by the control schemes (34), as real individual is fixed to stay within foucauldian *institutions*. This *dividualization* takes then place with the consent of the real actors, driven by their interest in the use of digital tools and in the benefits of this simulation (31). The participation of an actor to the control processes devoted to qualify data, relative to him and his environment, is motivated by its need to constitute himself as a *subject*, which takes shape through an act of *recognition* of its digital dual. This act of *recognition* is preceded each time the actor is “*interpellated*” by the system (in the sense of Althusser’s “interpellation” (35)) through *monitoring interfaces* provided by user’s personal numeric environment. The precise form of these interfaces impacts deeply the efficiency of the system (36). Our work will analyse the existing data governance paradigms and propose guidelines for a new paradigm directly inspired by previous considerations.

2 A New Data Governance Scheme for Extended Organizations

2.1 *The Existing Data Governance Paradigm's Limits*

The IT market devoted to data quality has grown through a series of relatively similar strategies and offers, entering the category of schemes called Master Data Management, that include all operations required by creation, modification or deletion of Master Data (37). The main challenge of MDM paradigm is to develop and/or strengthen processes of quality management (cleaning, de-duplication, ...) as systematically as possible (38). Thus, the analysis of business processes of the organization is a prerequisite for the implementation of this scheme (39) because the control channels, activated by a proposition to modify a Master Data, rely on the identification of data-stewards (40) with the required jurisdiction and level of responsibility to provide a level of truth to this proposal and to authorize ultimately its writing as a Master Datum (golden record). The very nature of extended organizations makes difficult the reorganization of Business Process Management (BPM) and therefore the application of the MDM scheme within them, because of

- the diversity and instability of their business processes ;
- the inefficiency of hierarchical authority over some actors of control channels promoted by the BPM, because of the prominent influence of networks and external environment ;
- the low adhesion of middle managers to issues of data quality (20) and the existence of resistance strategies from senior manager to BPM (20) ;
- the lack of control and the multiplicity of increasingly fragmented IT tools (41, 42);
- the difficulties posed by the establishment of data exchange protocols with partner organizations on a suitable collection of data ;
- the difficulties posed by the integration of data harvested from external sources.

While the MDM paradigm has nowadays established a monopolistic position on the market of data quality (39), it suffers from its inability to deal with complexity inherent to extended organizations (42, 43). To our point of view, another approach is needed in the way control processes are promoted by data governance scheme in extended organizations.

Adopting a completely opposite philosophy, another paradigm of data governance has taken a prominent place in recent years: the community paradigm that relies on self-organized online communities, oriented towards the creation and sharing of knowledge (44). The systems whose data governance model relies on this paradigm are recognized to produce data of a remarkable quality in a rather short time (45, 46). The final data (or its latest version) is the product of a social interactions process, embodied in the iterative and negotiated changes on a selected collection of data, between actors (45) within a virtual community (47). This pattern of data governance differs greatly from centralized disciplinary

systems based on MDM paradigm; it relies on a democratic relativism philosophy (48). Despite their efficiency, these systems remain, in our opinion, irrelevant to guarantee the conditions for deploying efficient data governance in extended organizations, because of:

- The data quality produced by the crowd in the community paradigm has been strongly criticized (49). Task conflicts within the group generate both positive and negative effects on the produced content (50, 51).
- The roles assigned to members within a community are self-regulated by the community, including content-oriented or administration-oriented roles (51, 52). The use of self-regulated control channels and the lack of transparency and responsibility of the authors (53) are a major obstacle to develop data governance framework based on community paradigm in extended organizations.
- The discrepancy between priority levels assigned to a same collection of data, respectively by top-level managers of the organization and by virtual community members concerned by these data, has critical consequences on the control channels efficiency.

As a result, the Community Paradigm, cannot by itself provide a complete answer to the problem of finding a data governance scheme adapted to extended organizations.

2.2 *The New Data Governance Panopticon Paradigm*

MDM paradigm has been developed along the lines of preceding technical developments and existing IS architectures (ERP, BMPS, ETL, DataWarehouse). The Panopticon paradigm requires the development of new tools and architectures to articulate regulatory and disciplinary mechanisms to achieve effective data governance. This articulation is made concrete through a subtle action on representations relied on by the calculation of interests by the stakeholders, shared through their monitoring interfaces, and a control of the accountability and empowerment of the actors. This paradigm inherits main contributions from the community paradigm, but aims to compensate for its shortcomings. We propose the IS architecture of the new paradigm to be based on the existence of a specific IS element, called Panopticon IS brick, acting as a hub between existing elements of the organization's IS and personal digital environments of the individual. Thus, the fundamentals of Panopticon paradigm are the following:

- Individuals can contribute within their own customized digital environment to a set of control processes on data belonging to their field of action. The data are presented in their current state of reliability, facing the user with the interpellation of the system to recognize its digital dual world and then constitute himself as a subject by using its power to tell their truth on these data. Unlike MDM solutions working downstream of IS elements, like a Extract-Transform-Load (ETL) system acts towards a Data Warehouse, Panopticon IS brick maintains its reference databases through real-time processes.

- Complete transparency and traceability are ensured on the set of required interventions made from individual actions or external sources (proposition to change the value of a given reference datum, reasoned opinion emitted to conclude within a given control channel, arbitration control between divergent control channels). Each actor involved in a control channel is then placed in an area of visibility for an invisible community of actors, concerned by the same data, in order to promote self-discipline and integration of norms. However, anonymity can be ensured on free contributions devoted to the warning about erroneous data and critical/ranking processes, in order to promote emancipation of the individual with respect to the issue of managing data.
- This approach is user-centric, in the sense that the collection of reference data, covered by the data governance scheme, is chosen according to the set of data used by the set of digital services offered to the users. User-interface is constantly adapted to the currently used services in order to optimally leverage personal interest of the users to get them to participate to control processes. This interest relies on its need to access services based on up-to-date and personalized data, to cooperate with other members of his networks, to develop competitive strategies to access shared resources, or to exercise his responsibilities.
- Numerous control channels exist for any given datum, a control channel is indeed associated to any community concerned by the different usages of this datum. Each control channel is formalized by the allocation of structuring roles and prioritized rights about this datum to any individuals within this community: rights to read, rights to freely warn for an erroneous data, rights and responsibility to propose a modification of a datum, rights and responsibility to evaluate/control the propositions to change a datum made by other individuals, right and responsibility to arbitrate between divergent controls. The set of control channels formalized by the system encompass the whole set of ties, controls or transactions, inherited from networks and coalitions existing within the organization, as well as conflictual and competitive relationships, although these relations are generically transverse to hierarchical relationships of the organization.
- Unlike in MDM scheme where the control channels are initial parameters for the system, the Panopticon paradigm allows the communities to self-organize the control channels. This bias is imposed by the objective fixed by the system to take into account the complex dynamics of these networks. Modifications made by an individual, on the hierarchical data belonging to its field of action, contribute to change this field of action, as well as the area of visibility within which he is located, but also to modify or constrain those of the other individuals. In order to conciliate the multiplication of self-organized control channels and the efficiency of the whole control process, we have to impose basic requirements: unlike in community-based data governance schemes a unique control channel associated to hierarchical channel inherits the arbitration power on the final decision and responsibility to change the golden record, the whole set of control channels concerned by the same collection of data are ranking/censoring/granting each other according to the rights they

have to act on hierarchical data corresponding to the details of the other control channels.

- While the MDM paradigm is not well adapted to the integration of external data sources, they should be extensively used by Panopticon scheme. They must be considered as well as the control channels emerged from communities to anticipate improvements and remedy to the control processes, which do not meet the appropriate data quality threshold. Control channels and data sources are subject to a ranking process by comparison with the results of other channels.
- The answer given by the MDM/ERP paradigm to the issue of fostering data exchange protocols between the organization and its partners is to impose a single integrative framework for business processes. By contrast, MDM paradigm neglects the existence of internal boundaries emerging within organizations from resistance strategies deployed by some of its sub-units. To deal with these two types of boundary problems, the strategy adopted by Panopticon paradigm should be to promote a "functional decentralization" of a significant part of the control processes through the development of a distributed IS architecture based on numerous instances of the Panopticon IS brick. This strategy promotes the dissemination of norms underlying the reference data-bases of the Panopticon IS brick, at the cost of losing visibility on a part of control processes carried out within the subunits.

3 Conclusion

After having clarified the constraints on data governance schemes within extended organizations, it became apparent that the current paradigms underlying the Master Data Management solutions, or adopted by digital networks communities, do not meet them. An analysis of the regulatory and disciplinary controls within these extended organizations has led us to propose a new paradigm to meet the constraints weighting on the deployment of such a scheme, it requires technological developments that should be the object of a specific research.

References

1. O'Neill, H., Sackett, P.: The Extended Manufacturing Enterprise Paradigm. *Management Decision* 32, 42–49 (1994)
2. Browne, J., Sackett, P.J., Wortmann, J.C.: Future manufacturing systems—Towards the extended enterprise. *Computers in Industry* 25, 235–254 (1995)
3. Lawrence, P.R., Lorsch, J.W.: Differentiation and Integration in Complex Organizations. *Administrative Science Quarterly* 12, 1 (1967)
4. Galbraith, J.R.: *Designing Complex Organizations*. Addison-Wesley Longman Publishing Co., Inc., Boston (1973)
5. Lavigne, A.: La communication institutionnelle vue par l'entreprise de six grands – Systèmes relationnels: proposition d'une typologie. *Communication et organisation* (2002)

6. Wang, R.Y., Strong, D.M.: Beyond accuracy: what data quality means to data consumers. *J. Manage. Inf. Syst.* 12, 5–33 (1996)
7. Batini, C., Cappiello, C., Francalanci, C., et al.: Methodologies for data quality assessment and improvement. *ACM Comput. Surv.* 41, 16:1–16:52 (2009)
8. Drucker, P.F.: *Management Challenges for the 21st Century*. Harper Business (2001)
9. Régnier-Pécastaing, F., Gabassi, M., Finet, J.: *MDM: Enjeux et méthodes de la gestion des données*, Dunod (2008)
10. Lemieux, V.: *Decentralisation, Politiques Publiques et Relations de Pouvoir*. PUM (2001)
11. Sia, S.K., Tang, M., Soh, C., et al.: Enterprise resource planning (ERP) systems as a technology of power: empowerment or panoptic control? *SIGMIS Database* 33, 23–37 (2002)
12. Elmes, M.B., Strong, D.M., Volkoff, O.: Panoptic empowerment and reflective conformity in enterprise systems-enabled organizations. *Inf. Organ.* 15, 1–37 (2005)
13. Bentham, J.: *Panopticon or The Inspection-House*. Miran Bozovic, London (1995)
14. Foucault, M.: *Surveiller et punir*, Gallimard (1975)
15. Foucault, M.: *Naissance de la Biopolitique*. Gallimard-Seuil (1979)
16. Foucault, M.: *Le sujet et le pouvoir, Dits et Écrits*, pp. 208–226. Gallimard (1982)
17. Robson, K., Cooper, D.J.: Power and management control. In: *Critical Perspectives in Management Control*, Wai Fong Chua, Tony Lowe and Tony Puxty, pp. 79–114. Macmillan (1989)
18. Doolin, B.: Information technology as disciplinary technology: being critical in interpretive research on information systems 13, 301–311 (1998)
19. Clegg, S.R., Courpasson, D., Phillips, N.: *Power and Organizations* (2006)
20. Beckett, C.: *Information Systems, Power and Resistance: A Genealogical Inquiry Into Failure*, The Information System Stream, Naples (2011)
21. Ezzamel, M., Delbridge, R.: The Strength of Difference: Contemporary Conceptions of Control. *Organization* 12, 603–618 (2005)
22. Foucault, M.: *Dits et Écrits 1976-1988*, Gallimard, Paris, France (1984)
23. Robins, K., Webster, F.: Cybernetic Capitalism: Information, Technology, Everyday Life. In: *The Political Economy of Information*, pp. 47–75. Vincent Mosco & Janet Wasko, Univ of Wisconsin Press (1988)
24. Zuboff, S.: *In the age of the smart machine: the future of work and power*. Heinemann Professional (1988)
25. Miller, P., O’Leary, T.: Accounting and the construction of the governable person. *Accounting, Organizations and Society* 12, 235–265 (1987)
26. Willcocks, L.: *Foucault, power/knowledge and information systems: reconstructing the present*. Wiley, Chichester (2004)
27. Klecun, E.: *Information and Communication Technologies (ICT) as Control Mechanisms*. Presented at the CMS7 2011 - 7th International Critical Management Studies Conference, Faculty of Economics. University of Naples Federico II - Naples (2011)
28. Witheford, N.: Cycles and Circuits of Struggle in High Technology Capitalism. In: Davis, J., Hirsch, T.A. (eds.) *Cutting Edge: Technology, Information Capitalism and Social Revolution*, pp. 195–242 (1997)
29. Legrand, S.: *Les normes chez Foucault*. PUF, Paris, France (2007)
30. Clarke, R.: The digital persona and its application to data surveillance. *The Information Society* 10, 77–92 (1994)
31. Poster, M.: Databases as Discourse, or, Electronic Interpellations. In: Lyon, D., Zureik, E. (eds.) *Computers, Surveillance, and Privacy*, p. 175. University of Minnesota Press (1996)

32. Latour, B.: Drawing things together. In: Dodge, M., Kitchin, R., Perkins, C. (eds.) *The Map Reader: Theories of Mapping Practice and Cartographic Representation* (2011)
33. Lyon, D.: *Electronic Eye: The Rise of Surveillance Society*. University of Minnesota Press (1994)
34. Lyon, D.: *Surveillance society: Monitoring Everyday Life*. Open University Press (2001)
35. Althusser, L.: *Idéologie et appareils idéologiques d'État*. *La pensée* 151, 3–38 (1970)
36. Simon, B.: The return of panopticism: Supervision, subjection and the new surveillance. *Surveillance & Society* 3 (2002)
37. Smith, H.A., McKeen, J.D.: Developments in Practice XXX: Master Data Management: Salvation Or Snake Oil? *Communications of AIS*, 63–72 (2008)
38. Otto, B., Hüner, K.M., Österle, H.: Toward a functional reference model for master data quality management. *Information Systems and e-Business Management* 10, 395–425 (2011)
39. Friedman, T., Bitterer, A.: *Magic Quadrant for Data Quality Tools*. Gartner Inc. (2012)
40. Loshin, D.: *Master Data Management*. Morgan Kaufmann (2009)
41. Dahlberg, T., Heikkilä, J., Heikkilä, M.: Framework and Research Agenda for Master Data Management in Distributed Environments. In: Leino, T. (ed.) *Proceedings of IRIS 2011*. TUCS Lecture Notes, vol. 15, pp. 82–90 (October 2011)
42. Silvola, R., Jaaskelainen, O., Kropsu-Vehkaperä, H., et al.: Managing one master data – challenges and preconditions. *Industrial Management & Data Systems* 111, 146–162 (2011)
43. Otto, B., Reichert, A.: Organizing master data management: findings from an expert survey. In: *Proceedings of the 2010 ACM Symposium on Applied Computing*, pp. 106–110. ACM, New York (2010)
44. Lee, G.K., Cole, R.E.: From a Firm-Based to a Community-Based Model of Knowledge Creation: The Case of the Linux Kernel Development. *Organization Science* 14, 633–649 (2003)
45. Korfiatis, N.T., Poulos, M., Bokos, G.: Evaluating authoritative sources using social networks: an insight from Wikipedia. *Online Information Review* 30, 252–262 (2006)
46. Liu, J., Ram, S.: Who Does What: Collaboration Patterns in the Wikipedia and Their Impact on Data Quality. SSRN eLibrary (2009)
47. Balasubramanian, S., Mahajan, V.: The Economic Leverage of the Virtual Community. *Int. J. Electron. Commerce* 5, 103–138 (2001)
48. Grassineau, B.: *Wikipédia et le relativisme démocratique*. *Observatoire des Mondes Numériques en Sciences Humaines* (2007)
49. Lipczynska, S.: Power to the people: the case for Wikipedia. *Reference Reviews* 19, 6–7 (2005)
50. Viégas, F.B., Wattenberg, M., McKeon, M.M.: The Hidden Order of Wikipedia. In: Schuler, D. (ed.) *HCI 2007*. LNCS, vol. 4564, pp. 445–454. Springer, Heidelberg (2007)
51. Arazy, O., Nov, O., Patterson, R., et al.: Information Quality in Wikipedia: The Effects of Group Composition and Task Conflict. *Journal of Management Information Systems* 27, 71–98 (2011)
52. Ren, Y., Kraut, R., Kiesler, S.: Applying Common Identity and Bond Theory to Design of Online Communities. *Organization Studies* 28, 377–408 (2007)
53. Santana, A., Wood, D.J.: Transparency and social responsibility issues for Wikipedia. *Ethics and Information Technology* 11, 133–144 (2009)