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RECONCILING COMPLEX ORGANIZATIONS AND DATA MANAGEMENT: THE *PANOPTICON PARADIGM*

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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

1 INTRODUCTION

Ten years ago, TDWI (The Data Warehousing Institute) estimated at \$ 600 billion the cost of erroneous data in business sector. In a new Ovum report (Madan, 2010), the analyst « estimate that bad data costs US companies 30 per cent of their revenues – a massive \$700 billion per year », due to the inefficiency it causes and through lost customers, sales and revenue. Bad data includes incorrect and outdated values, missing data and inconsistent formats. In fact, data quality control within an organization is a key requirement for the implementation of management control 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. There are many data quality tools available to help businesses reduce the effect on their bottom line (Madan, 2010). 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, based on theories developed by the French philosopher Michel Foucault better suited to the specific challenges addressed by extended organizations.

2 CHALLENGES OF DATA MANAGEMENT WITHIN EXTENDED ORGANIZATIONS

2.1 Management within extended organizations and Information Technologies

The notion of *extended organization* (O'Neill and Peter Sackett, 1994; J. Browne et al., 1995) 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 entities¹.

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 (Lawrence and Lorsch, 1967; Galbraith, 1973). The importance of networks in the development of cross-integration mechanisms may be preminent over organization's hierarchical

¹ A famous "extended enterprise" in the 1990s was Chrysler Corporation (Chrysler have one of the first extranets, a private network for securely sharing data with suppliers Internet) that develops collaborative relationship between supply chain members. The term "extended enterprise" is used to describe a firm's supply, production, and logistics and distribution networks (Krishnan et al., 2007) and has been described in the literature as consisting of network of independent formal organizations, centred around a core organization, pursuing a joint mission (Hedberg, 1997; Jarillo, 1993; Miles and Snow, 1986) with an explicit joint purpose and a division of labour in that task. Extended enterprises consisting of tele-computing mediated chains of suppliers, manufacturers, assemblers, distributors and customers, compete to supply quasi-customised products to discerning markets (Jim Browne and Zhang, 1999). Nevertheless, our analysis aims to encompass a considerably enlarged set of organizations (including public organizations likewise universities, international non-profit organizations, medical and social systems, systems concerned by environmental monitoring, etc.) suffering generically from the difficulties to maintain a complete set of stable and efficient business processes devoted to consolidate their steering data.

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 (Lavigne, 2002). Previous considerations results in a set of consequences for extended organizations² we wish to clarify in Figure 1:

- The missions of extended organizations spread across its subunits, its funding mechanisms and the service delivery of a large range of actors to its benefit are very diverse;
- The *scope of activity* of the organization exceeds that of its own *hierarchical authority*;
- The relationships based on *controls, transactions or ties woven within intra- inter- or trans-organizational networks* may be prominent on the hierarchical relationships of the organization;
- The contractual relationships with other organizations may impose a *joint management control* of certain shared activities or entities;
- Independent institutions may produce evaluations of its activities, based on *external data sources*, and hanging over its funding and reputation.

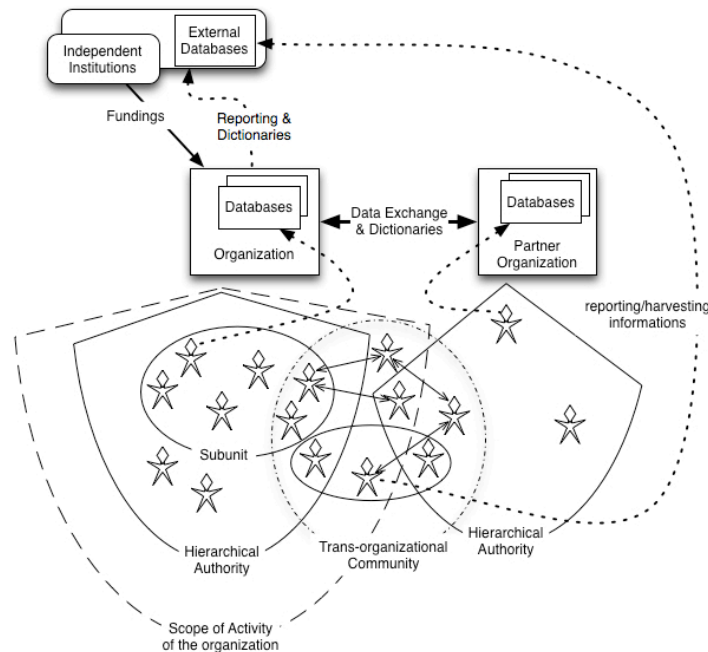


Figure 1. Extended organization

Recent developments in Information Technology (IT) provide new perspectives for dealing with complex organizational transformations (Besson and Rowe, 2012) and organize their intra- and inter-organizational processes in a dynamic strategic alignment (Henderson and Venkatraman, 1993). These tools have to process information from different entities in a multidimensional view (Markus, 2010). The organization's extensive control relies increasingly on complex intra and inter-organizational IT systems (Barrett and Konsynski, 1982). These IS have tremendously evolved since the 90s, firstly through a deployment of re-engineering, followed by a period of deployment and

² These considerations can be easily enlightened in the case of Universities considered as paradigmatic examples of extended organizations. Faculties coordinate their teaching activities, whereas research programs concern their laboratories. They benefit from an extremely diverse source of funding, including registration fees, contract revenues, donations, governmental supplies, international partnerships, etc. Hierarchical authority of top-level management within university is often disregarded by people concerned by the activities of the University, which preferentially exchange information through the networks they are involved in (scientific community for scientists, alumni for students, etc.). National or international foundations proceed to evaluations of the activities of the university based on commonly available data coming from independent external sources (web of science, etc.).

implementation of ERP, CRM, PLM, SCM, DSS, BI⁴ (Besson and Rowe, 2012). The integration of complex IS, rapidly raised issues of consistency relying on the need to use the same data set for all operational applications.

2.2 Issues of data governance within extended organizations

Deployment of IT puts data, their collation, processing, dissemination and quality (Wang and Strong, 1996; Batini et al., 2009) issues at the heart of operational management control and decision-making activities (Drucker, 2001). Data underlying management and decisional processes of most organizations are of various types (Wolter and Haselden, 2006) : *unstructured data* (associated to unnormalized documents), *transactional data* (registered from interactions between actors), *metadata* (fixing norms for other data and for processes), *master data* characterizing the different entities of the organization (agent, resources, administrative bodies, clients, partners,...), and *hierarchical data* (fixing relations between other data inherited from organizational structure). Data Governance formalizes the allocation scheme for rights and duties concerning the use and the management of data within organizations (Weber et al., 2009; Khatri and Brown, 2010) and encompasses everything that can optimally deal with quality, availability, safety and compliance of data with regulations and standards (Otto, Yang W. Lee, et al., 2011; Friedman and Bitterer, 2012). Data governance scheme offers a framework for the definition, distribution, synchronization and exchange of reference values for Master Data (Régner-Pécastaing et al., 2008). 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 (Régner-Pécastaing et al., 2008): 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 actual 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 (Lemieux, 2001).

- 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* (Lemieux, 2001) 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* (Lemieux, 2001), based on the contractual relationship between the organization and its partners, rather than in its most extreme form of devolution (Lemieux, 2001).
- Certain business processes encompassed by the data governance scheme of the extended organization inevitably involve numerous actors favoring the relations they have woven within networks over the hierarchical controls of the extended organization. The limited efficiency of

⁴ Enterprise Resource Planning, Customer Relationship Management, Product Lifecycle Management, Supply Chain Management, Decision Support System, Business Intelligence

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 *normative communications* through tools, standards and processes that underpin the organization's data governance framework, these *normative communications* being ensured by other unformalized channels. This formalization may be based on the development of structured digital social networks intimately integrated in the pattern of data governance, this will be the main focus of our proposed Panopticon paradigm.

- 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 *ranking of sources* appears necessary when facing a deliberate choice of using multiple sources of data.

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.

2.3 The panopticism as a data governance paradigm

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 (Sia et al., 2002; Elmes et al., 2005). These studies pointed the proximity of these mechanisms and those of the ideal control paradigm represented by the Panopticon architecture⁶, devised by Jeremy Bentham (Bentham, 1995) and developed by Michel Foucault (Foucault, 1975). 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. The panopticism is a power that does not need to manifest itself physically, to become effective. 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" (Foucault, 1975, p. 81). The panopticism is "a general formula that characterizes a type of government" (Foucault, 1979, p. 64). 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" (Foucault, 1975, pp. 235–236). A second interpretation of the Panopticon is then summarized by Foucault: "The Panopticon is the formula of liberal *governmentality*," "this new governmental rationality is solely concerned by *interests* and aims at manipulating them" (Foucault, 1979, p. 41). Foucault emphasizes the singular relationship existing between regulatory systems and disciplinary institutions (e.g. law system vs. penitentiary institutions, medicine vs. clinic institutions, psychiatry vs. asylum, etc.) and the way this interplay acts on rational discourse and subjects to transform them according to strategic purposes. His analysis contradicts the standard viewpoint considering the social norm as being transcendently founded and deployed by a law system, which fixes to the penitentiary institution the role of excluding or straighten abnormal individuals. He insists firstly on the artificial character of law system, which intrinsically appears as a seemingly coherent and centralized discourse covering an abundant and diverse set of "local" regulatory (constraining/incentive) mechanisms made of "illegalisms" and exclusively readable in terms of individual interests. He then shows that penitentiary institution has neither been produced nor organized directly by modern law system. Penitentiary institution did pre-

⁶ initially proposed by Bentham as an architectural precept for the building of jails, hospital, schools justified by the necessity to adapt these spaces to the purpose of controlling the subjects, this diagram has been idealized and generalized by Bentham as a fundamental principle ensuring the moral behaviours of citizens in a liberal society.

exist in a quite independent history regarding law system. At the beginning of modern period, penitentiary institutions, and the disciplinary mechanisms they were formalizing, appeared to be amazingly adapted to deal with the new issues addressed by emerging industrial production system to the law system (straightening of individual as production resources, protection of productive capital, etc.) and to produce a new normalized subjectivity adapted to these. Hence, penitentiary institutions have been fruitfully used by and articulated with law system to deal with and formalize abnormality regarding common rules. This remarkable articulation between regulatory mechanisms and disciplinary institutions is responsible for the dissemination throughout the whole society of disciplinary technologies and for the integration of these new social norms, imposed by social transformations, into the rational discourse produced within normalization society (Deleuze, 1986, chap. 2, 'Un nouveau Cartographe'). To summarize, the data governance paradigms within extended organizations raise a double perspective clarified by Michel Foucault: "the norm is something that can be applied to both a body one wishes to discipline and a population one wishes to regularize. The normalization society is not, in these circumstances, a kind of generalized disciplinary society whose disciplinary institutions have spread and eventually covered the entire space. The normalization society is a society where norm of discipline and norm of regulation intersect along an orthogonal articulation" (Foucault, 1976, p. 225). Previous considerations are schematized in Figure 2.

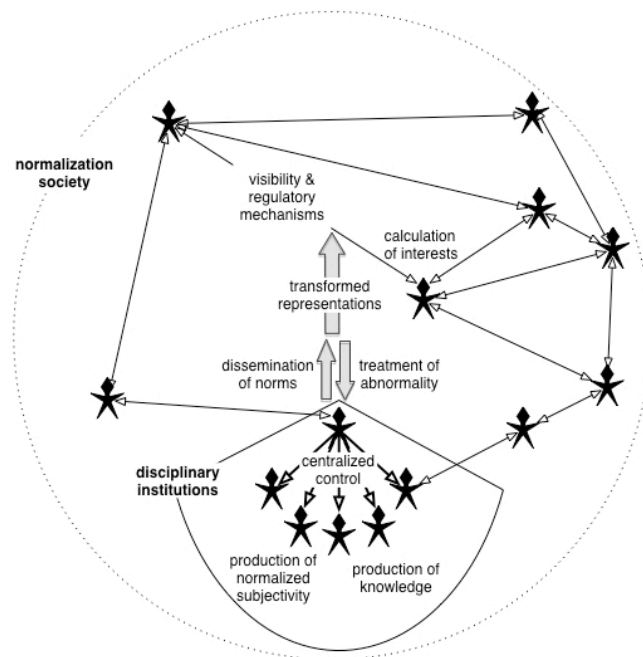


Figure 2. Regulatory and disciplinary mechanisms within normalization society

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, data governance has to deploy "a better and better controlled - more and more rational and economic - adjustment between productive activities, communication networks and the interplay of power relations", it has to develop "a program of governmental rationality... to create a system of regulation of the general conduct of individuals whereby everything would be controlled to the point of self-sustenance, without the need for intervention". 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*. In this way, panoptic power maximizes its action that is to "conduct the conducts" (Foucault, 1982). The use of foucauldian analysis for data governance paradigms study imposes a shift of the standard viewpoint concerning Information Systems, as well as some completions of Foucault's analysis to consider peculiarities of Information Technologies. Michel Foucault focuses his studies on *institutions* in their specific ability to fix

individuals in “a place and a collective body there is no way to leave” (Legrand, 2007). 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 (Clarke, 1994; Poster, 1996; Latour, 2011). 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 (Lyon, 1994). The digital dual is obediently and indefinitely usable for simulations coordinated by the control schemes (Lyon, 2001), 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 (Poster, 1996). 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 proceeded each time the actor is “*interpellated*” by the system (in the sense of Althusser’s “interpellation” (Althusser, 1970)) through *monitoring interfaces* provided by user’s personal numeric environment (Figure 3).. The precise form of these interfaces impacts deeply the efficiency of the system (Simon, 2002).

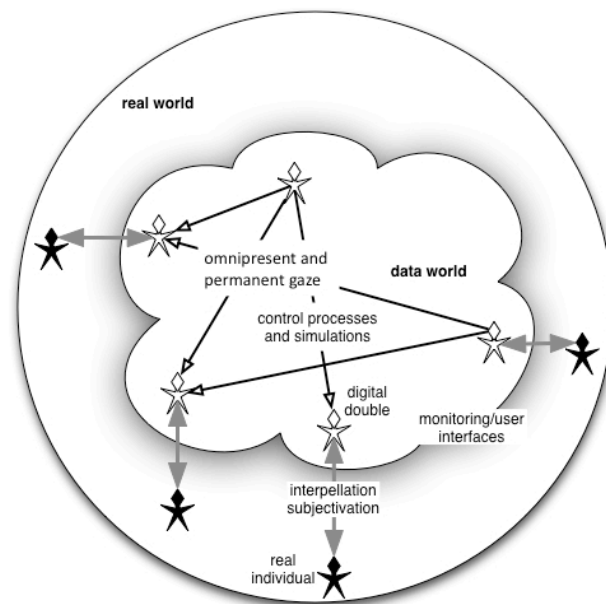


Figure 3. Panopticon and data world

Previous analysis follows the same singular methodological approach Michel Foucault adopts, by refusing 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 through a network woven between them, the *subject* resulting from a multiplicity of *subjugation arrangements* within them. The conceptual framework offered by Foucault appeared very fruitful 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 (Miller and O’Leary, 1987; Willcocks, 2004; Klecun, 2011). 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 (Robins and Webster, 1988; Zuboff, 1988), and

making of IT powerful tools to promote a disciplinary power over individuals, along the lines of Foucault's early works on Panopticon (Foucault, 1975). However, this interpretation of digital environments in terms of disciplinary power should be clarified in its singularity. Firstly, prison discipline and disciplines within traditional organizations are immeasurable, one being of a moral nature while the other is of an instrumental one (Lyon, 1993). Then, the isolation of the individual at the heart of the Panopticon, which makes of him "the object of information, never the subject of communication" (Foucault, 1975), 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 (Witthof, 1997). 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 (Robson and Cooper, 1989). Foucault's study of the articulation between regulatory system and disciplinary institutions grounds a critical method to analyse the *transformation* of control processes, which suggests to transcend the purely institutional standpoint and to emphasize: 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 globalizing rationality/purpose made possible by this usage and absorbing it (Foucault, 1984). This standpoint is then obviously adapted to study the resistance mechanisms to the deployment of control processes underlying ERP within extended organizations (Doolin, 1998; Clegg et al., 2006; Beckett, 2011). More generally, Foucault's analysis leads to doubt on the relevancy for extended organizations of IS paradigms based on purely disciplinary mechanisms: top-level management fixing "transcendental" norms for data quality, deployment of "institutionalizing" control frameworks based on established business processes based on the deployment of rigid ERP strategies and the allocation of rights/accounting to a restricted number of hierarchically controlled individuals, unformalized data exchanges within intra-, inter- or trans-organisational networks based on shared or competitive interests. It suggests to build a new conceptual approach of the IS architecture within extended organizations, focussing on the articulation between regulatory and disciplinary mechanisms involved in data management and on the way the data governance scheme is formalizing: the production process of normalized subjectivity for any individual, the dissemination of norms and the establishment of a rational/normalized discourse throughout inter-individual data exchanges concerning basic needs and usages of people within the organization, the "gouvernementality" processes through which top-level management can "conduct the conducts" of individuals to ensure that new disseminating norms are relevant for strategic objectives of the organization.

Our work will analyse the existing data governance paradigms and propose guidelines for a new paradigm directly inspired by previous considerations.

3 TOWARDS A DATA GOVERNANCE SCHEME ADAPTED TO EXTENDED ORGANIZATIONS

The preceding analysis has led us to present the issues of data governance in extended organizations, in the light of Panopticon paradigm. We propose to analyse the specific characters and shortcomings of the existing paradigms of data governance, MDM and Community paradigms. We thus provide a preliminary analysis of a new data governance paradigm adapted to extended organizations.

3.1 Nature and shortcomings of the MDM Data Governance paradigm

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 (Smith and McKeen, 2008). The main

challenge of MDM paradigm is to develop and/or strengthen processes of quality management (cleaning, de-duplication, ...) as systematically as possible (Otto, Hüner, et al., 2011). Thus, the analysis of business processes of the organization is a prerequisite for the implementation of this scheme (Friedman and Bitterer, 2012) because the control channels, activated by a proposition to modify a Master Data, rely on the identification of data-stewards (Loshin, 2009) 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 success of the deployment of MDM systems relies on the very strong assumption that organizations are homogeneous and highly hierarchically structured (Figure 4). Thus, MDM scheme relies on:

- the identification of a set of stable-over-time business processes ;
- the clear and precise identification of roles and responsibilities of a limited number of data-stewards, data-owners and data-committees, placed under the hierarchical authority of the organization, adhering to data quality issues (Khatri and Brown, 2010; Otto, Hüner, et al., 2011) ;
- the direct control on IT tools and master databases (rights for READ,WRITE and ADMIN) used by digital services and operational applications, as well as the use of an integrated digital environment, in order to systematize the dissemination of golden records across applications.

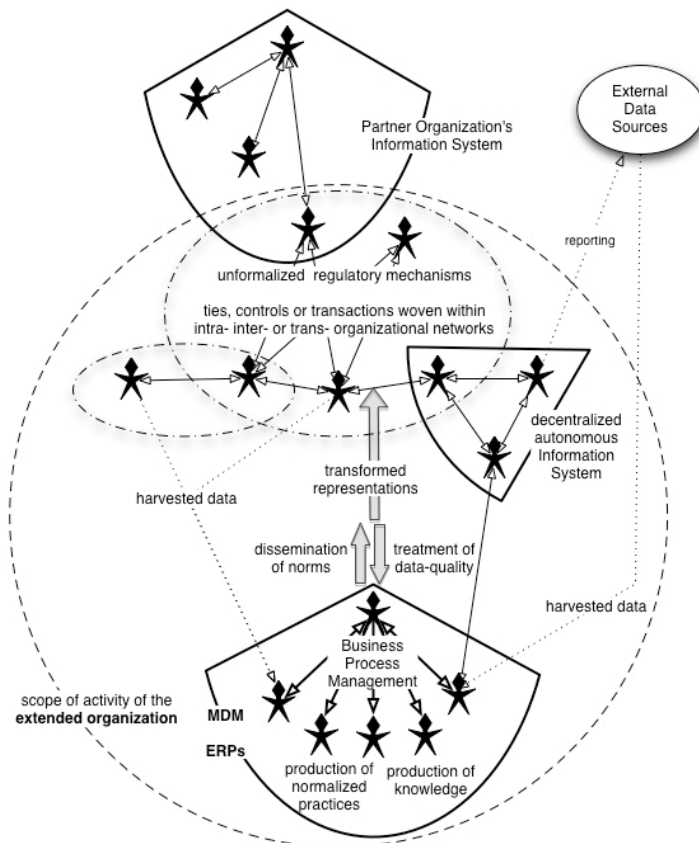


Figure 4. MDM scheme facing extended organization's data governance issues

The very nature of extended organizations make 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 elements of control channels promoted by the BPM, because of the prominent influence of networks and external environment on many actors involved in these processes ;

- the low adhesion of middle managers to issues of data quality (Beckett, 2011) and the existence of resistance strategies from senior manager to BPM (Beckett, 2011) ;
- the lack of control, and the multiplicity of IT tools and databases increasingly fragmented (Dahlberg et al., 2011; Silvola et al., 2011);
- 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.

Previous considerations are schematically represented on Figure 4.

While the MDM paradigm has nowadays established a monopolistic position on the market of data quality (Friedman and Bitterer, 2012), it suffers from its inability to deal with complexity inherent to extended organizations (Otto and Reichert, 2010; Silvola et al., 2011). To our point of view, another approach is needed in the way control processes are promoted by data governance scheme in extended organizations.

3.2 Nature and shortcomings of the Community Data Governance paradigm

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 (Gwendolyn K. Lee and Cole, 2003).

The main examples of collaborative projects based upon virtual communities are open source software (OSS) (Von Krogh and von Hippel, 2006) and the development of Wiki technologies. Wiki Technologies allow collaborative, open, egalitarian and anonymous publishing and editing processes of data (Wagner, 2004), using mechanisms that track revision history (Raman, 2006). One of the best-known applications of Wiki systems is the collaborative online encyclopaedia Wikipedia (Giles, 2005; Lipczynska, 2005; Arazy et al., 2011).

The systems whose data governance model relies on this paradigm are recognized to produce data of a remarkable quality in a rather short time (Korfiatis et al., 2006; Liu and Ram, 2009). 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 (Korfiatis et al., 2006) within a virtual community (Balasubramanian and Mahajan, 2001). This pattern of data governance differs greatly from centralized disciplinary systems based on MDM paradigm; it relies on a democratic relativism philosophy (Grassineau, 2007).

As shown by the literature on Group Decision Support Systems, the quality of contents being guaranteed by the existence of regulatory mechanisms, ensuring the emergence of virtuous behavior of actors regarding the use and management of data (Connolly et al., 1990), and formalize a hidden hierarchical structure underlying Wiki communities (Viégas et al., 2007). Another key requirement to promote quality of content emerging from free interactions is the *transparency* and *traceability* of the editors' actions, which help to develop confidence of actors and *emancipatory effects* of the system (Hansen et al., 2009). Cardon and Levrel (2009) use the terms of participatory vigilance to describe Wikipedia's governance and its procedural system of self-regulation, for example.

Lastly, a key factor for the development of these schemes is their ability to get their actors use a universal common digital environment, adapted to the management of interactions within communities and offering associated services of interest.

Despite their efficiency, these systems remain, in our opinion, insufficient on their own to guarantee the conditions for deploying efficient data governance in extended organizations, due to numerous reasons:

- The data quality produced by the crowd in the community paradigm has been strongly criticized (Lipczynska, 2005). Task conflicts within the group generate both positive and negative effects on the produced content (Viégas et al., 2007; Arazy et al., 2011).

- The roles assigned to members within a community are self-regulated by the community, including content-oriented or administration-oriented roles. The use of self-regulated control channels and the lack of transparency and responsibility of the authors (Santana and Wood, 2009) 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, despite its undeniable success, cannot by itself provide a complete answer to the problem of finding a data governance scheme adapted to extended organizations.

3.3 Guidelines for a new data governance paradigm: Panopticon

The fundamental difficulties, encountered by the top-level management of an extended organization in deploying a data governance scheme, is neither the “enforcement” of “vigilance” in surveillance and of compliance with pre-established data governance rules and data structures by some extra monitoring processes developing visibility on data-stewards, nor the “negotiation” of these rules with some middle managers or partners, but truly that the essential part of *normative communications concerning data quality control* is *unformalized* by data governance scheme, as soon as they are exchanged between individuals, driven by some “uncaptured” interests and who are not concerned by the hierarchically founded business processes, throughout networks which are generically disconnected/unarticulated to the control processes deployed by a purely disciplinary data governance scheme. According to our analysis of the interplay between regulatory and disciplinary mechanisms along Foucault’s philosophy, it appears that the relevant data governance paradigm must be primarily focused on the establishment of processes allowing to “capture” in the data world of the organization and formalize these *unformalized normative communications* responsible for significant regulatory mechanisms within the organization, in a way allowing an efficient interplay with the existing “disciplinary” processes ensuring data quality (ERP, etc.).

In order for the new data governance scheme to focus on this interplay/articulation between regulatory and disciplinary mechanisms, the collection of data covered by the scheme is preferably chosen according to the possibility for the largest population of individuals to understand and adopt chosen norms and data structures, to link them to democratized numeric and real services based on these data, and to the existence of various orthogonal control channels for any datum. In a sense, this paradigm aims to capture main contributions from MDM and community paradigm, but to compensate for their shortcomings. We want to insist that such a project goes far further the deployment of a social network “around” standard IS data management tools within an extended organization. More ambitiously, Panopticon paradigm is intended to formalize the architecture of visibility and power within the organization, and to promote a specific control of the top-level management on the *articulation between regulatory and disciplinary mechanisms* to promote the norms and strategic objectives they have chosen.

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. We propose the IS architecture of the new paradigm to be based on the existence of a specific IS element, called Panopticon IS brick, complementing standard “disciplinary” data governance IS tools (ERP, MDM, etc.) and acting as a hub between existing elements of the organization’s IS and personal digital

environments of the individual. Deployment of the Panopticon data governance paradigm could lead to radical transformations of business practices that should be studied through a pilot project¹⁰.

We propose to consider the following building principles as fundamentals of Panopticon paradigm (in the following items, italics are pointing the theoretical aspects inherited from our previous analysis we are referring to):

- The Panopticon paradigm is user-centric, it confers a central role to *monitoring interfaces* opened to users through their personal digital environment. 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 engaging him to *constitute as a subject* by using its power to tell their truth on these data. Unlike MDM solutions working downstream of SI elements, like a Extract-Transform-Load (ETL) system acts towards a Data Warehouse, Panopticon IS brick maintains its reference databases through real-time processes.
- The user interface has to offer to each individual a complete overview on the services he can access to, but also on the rights and responsibilities accorded to him on a selected collection of reference data covered by the data governance scheme. The engagement of individuals, into the active control processes on shared data, 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. The way the user interface links the set of services in access to the user, on one hand, to the selected collection of data on which these services are based, on the other hand, impacts strongly the *calculation of its interests* to exercise its power on data belonging to its of field of action. Hence, the adaptation of this user interface is the way top-level management can deploy its *liberal governmentality*, by modeling the *representations* of the user to promote and disseminate norms and data structures chosen along data governance scheme.
- Panopticon IS brick aims to *formalize the normative communications concerning data quality* which primarily escape to the hierarchical normative communications. As a consequence, the user interface relies explicitly on the standards and norms, fixed by the data governance scheme for the restricted collection of data covered by Panopticon paradigm and implemented along the coexistent “disciplinary” systems ensuring a more canonical process devoted to ensure data quality (ERP, MDM, etc.), in order to control efficiently the *articulation between regulatory and disciplinary mechanisms*.
- Complete *transparency* and *traceability* are ensured on the set of required interventions made from individual actions or *external data 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 *emancipatory effects* on the individual with respect to the issue of managing data.

¹⁰ The authors have clearly in mind some explicit pilot development underlying our proposed data governance paradigm (this project recently developed within a French University and involving some of its partners - national science organizations, innovative companies, etc.- focuses on an extremely restricted domain of data corresponding to workplaces occupation, localization and activity of teachers/scientists, planning of lectures completed by students, personal access to numeric and real services, services devoted to organize mobility of scientists, etc.). Universities appear clearly as too complex and too liberally organized to allow for a large deployment of a MDM scheme. The explicit analysis of such examples, which would be all the way of limited interest for most of the private companies considered as extended organizations, is devoted to a separate work. However, the authors want to emphasize the nature of the innovative and conceptual breakthrough necessary to encompass such “radically” extended organizations, which are till now simply out of scope of the software companies’ mainstream.

- Different individuals are sharing the access to services and inherit potentially conflicting responsibilities on data, the *field of action* offered by the user interface becomes intrinsically an *area of visibility* for the other actors to monitor each action realized by the user. As a result, numerous control channels exist for any given datum, a control channel is indeed associated to any community/networks concerned by the different usages of this datum. The formalization of the Benthamian “invisible chain”, produced by a Panopticon’s visibility on their actions, supposes the IS to realize a flexible and dynamic self-management of these control channels. 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 *intra- inter- or trans-organisational 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 adaptation of norms to the purpose of establishing *dictionaries* with *external data sources* is a key element of the conception of this scheme.
- 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 databases of the Panopticon IS brick, at the cost of losing visibility on a part of control processes carried out within the subunits.

We summarize those assumptions on figure below.

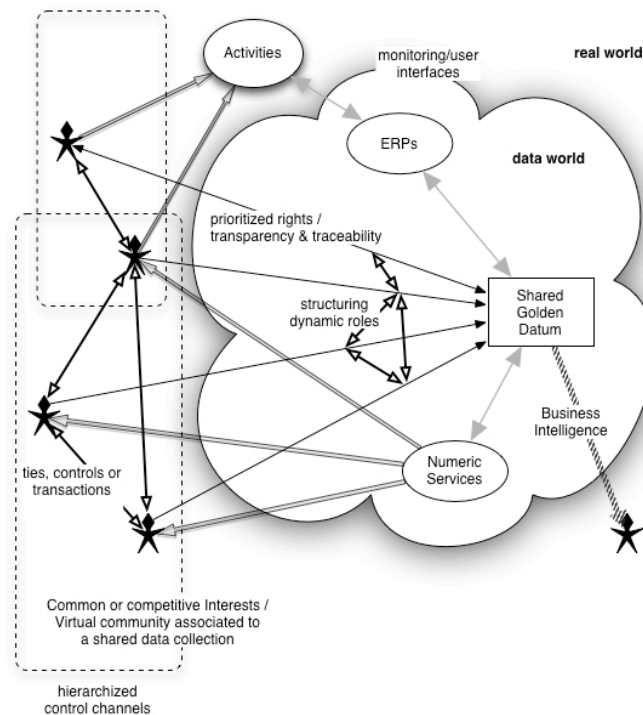


Figure 5. Panopticon data governance paradigm

4 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.

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