"Control through Communication" in a Comparative Perspective[*]

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RÉSUMÉ Aux États-Unis entre 1870 et 1920, aux Pays-Bas et en Allemagne entre 1880 et 1930, les organismes gouvernementaux et les entreprises adoptent de nouvelles technologies pour la production, la reproduction, l'entreposage et la recherche de documents. On introduit de nouvelles technologies et styles de communication descendante, de reddition de comptes hiérarchique et de correspondance interne, dans le but de renforcer le contrôle au moyen de la communication. Le bureau devient un noeud d'innovation technologique, créant de nouvelles fonctions et une nouvelle hiérarchie qui se reflètent dans les édifices à bureau, leur aménagement et leur ameublement. La technologie joue un rôle de facilitation et de promotion, mais ne constitue pas la cause première des innovations. Les gestionnaires impliqués jouent un rôle important dans l'introduction des nouvelles techniques de communication; les réseaux nationaux et internationaux de gestionnaires de documents et de fournisseurs de technologie pour le bureau se révèlent tout aussi importants. La reconnaissance de l'importance historique du contrôle par la communication permet de mieux comprendre les innovations présentes et futures des technologies de gestion des documents dans leurs contextes social et culturel.

ABSTRACT In the United States between 1870 and 1920, in The Netherlands and in Germany between 1880 and 1930, business and government agencies adopted new technologies for the production and reproduction of documents, their storage and retrieval. New technologies and genres of downward communication, upward reporting, and internal correspondence were introduced to enhance control through communication. The office became an "innovation junction" of technologies, creating new functions and a new office hierarchy that was reflected in office buildings, lay-out, and furnishing. Technology was an enabling and promoting actor, but not the primary cause of innovation. Committed managers played an important role in introducing new communication technologies. National and international networks of records management specialists and providers of office technologies were equally important. Recognition of the history of control through communication may contribute to understanding current and future adaptation and innovation of record-keeping technologies in their social and cultural contexts.

Control through Communication

Since its publication in 1989, JoAnne Yates' *Control through Communication. The Rise of System in American Management* has been acclaimed a superb analysis of the transformation of internal communication in American business between 1850 and 1920. Unlike most other historical perspectives on organizational communication, Yates' focus on record-keeping makes her book one of the few "classics" in the history of record-keeping.[1] Deservedly, *Control through Communication* is cited frequently in scholarly and professional publications on the history of records and archives. Her book is based on case studies of the Illinois Central Railroad, Scovill Manufacturing Company, and E.I. du Pont de Nemours & Company. To what extent are these cases exemplary for American business (and the service industries, not included in Yates' research) between 1850 and 1920 or for business outside the U.S.?

Because archivists as keepers and as mediators of archival knowledge have to be scholars of record-keeping, the history of record-keeping systems and technologies has a prominent place in their education.[2] Students at the University of Amsterdam, taking Yates' study as a model, did research in the archives (dating from 1850 to 1940) of seven Dutch companies: two public utilities (The Hague and Tilburg municipal gas, electricity, and waterworks), the central bank of The Netherlands (Nederlandsche Bank), a mining company (Billiton), an oil company (Royal Dutch/Shell), a department store (Bijenkorf), and a railway company (Staatsspoorwegen).[3] This research was supplemented by data on other companies and government agencies, from

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1 JoAnne Yates, *Control through Communication. The Rise of System in American Management* (Baltimore and London, 1989); JoAnne Yates, "Business Use of Information and Technology During the Industrial Age," in Alfred D. Chandler and James W. Cortada, eds., *A Nation Transformed by Information: How Information has Shaped the United States from Colonial Times to the Present* (Oxford and New York, 2000), pp. 107–135; Barbara L. Craig, "Rethinking Formal Knowledge and its Practices in the Organization," *Archival Science* 2 (2001), p. 112, footnote 2.

2 Richard J. Cox, "Advocacy in the Graduate Archives Curriculum: A North American Perspective," *Janus* 1 (1997), p. 32; Richard J. Cox, *No Innocent Deposits: Forming Archives by Rethinking Appraisal* (Lanham, 2004), pp. 179, 216.

3 We summarized the findings of our research in: Eric Ketelaar, "Besturen door registratuur, 1870–1940," in Peter J. Horsman, Frederick C.J. Ketelaar, and Theo H.P.M. Thomassen (eds.), *Context. Interpretatiekaders in de archivistiek. Jaarboek 2000 Stichting Archiefpublicaties* ('s-Gravenhage, 2000), pp. 97–109; Dick Brongers, "Informatiestromen bij de Haagse Duinwaterleiding," Ibid., pp., 110–121; Nadia Lehmann, "Besturen door registratuur bij de gemeentelijke gas-en elektriciteitsfabrieken te Tilburg," Ibid., pp. 122–27; Charlene Macdonald, "Het Intelligence Office van de Billiton Maatschappij," Ibid., pp. 128–36; Annelot Vijn, "Besturen door registratuur bij de Bijenkorf," Ibid., pp. 137–44; Hans Waalwijk, "Besturen door registratuur bij De Nederlandsche Bank," Ibid., pp. 145–57; Coretta Wijbrans, "Besturen door registratuur bij de Staatsspoorwegen," Ibid., pp. 158–66. Marianne A. Vos is writing a thesis on the innovations in record-keeping at Royal Dutch/Shell.

archives, commemorative volumes and other literature, including the recently published "official" Dutch history of office and information technology.[4]

As we will see, innovations in Dutch record-keeping were to a large extent based upon adaptations of systems developed in other countries, especially in neighbouring Germany. German case studies comparable to Yates' work are not available. Yates' generalized findings, however, have been used and supplemented in recent German literature which makes it possible to include in our comparative study some of the history of record-keeping in German public and private bureaucracies.[5]

Archivization and Remediation

Why study the history of control through communication? As Hugh Taylor emphasized, the technologies of records creation, maintenance, and use colour the contents of the record, and also affect its form and structure.[6] To quote Jacques Derrida "the mutation in technology changes not simply the archiving process, but what is archivable – that is, the content of what has to be archived is changed by the technology."[7] The discursive style of an e-mail is quite different from that of a pen-written letter. But the content is different too, if only because the time lag between sender and receiver has been reduced to sec-

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4 Jan van den Ende, ed., "Kantoor en informatietechnologie," *Techniek in Nederland in de twintigste eeuw* 1 (Zutphen, 1998), pp. 209–348.

5 Cornelia Vismann, *Akten. Medientechnik und Recht (*Frankfurt am Main, 2000); Markus Krajewski, *Zettelwirtschaft. Die Geburt der Kartei aus dem Geiste der Bibliothek* (Berlin, 2002). I have also benefited enormously from three recent studies of German governmental record-keeping: Angelika Menne-Haritz, *Geschäftsprozesse der öffentlichen Verwaltung. Grundlagen für ein Referenzmodell für elektronische Bürosysteme* (Heidelberg, 1999) (English edition: *Business Processes. An Archival Science Approach to Collaborative Decision Making, Records, and Knowledge Management* (Dordrecht, Boston and London, 2004); Heinz Hoffmann, *Behördliche Schriftgutverwaltung. Ein Handbuch für das Ordnen, Registrieren, Aussondern und Archivieren von Akten der Behörden* (München, 2000); Thea Miller, "The German Registry: The Evolution of a Record-keeping Model," *Archival Science* 3 (2003), pp. 43–63.

6 Hugh A. Taylor, "'My Very Act and Deed': Some Reflections on the Role of Textual Records in the Conduct of Affairs," *American Archivist* 51 (1988), pp. 456–69. See also Eric Ketelaar, "Archivalisation and archiving," *Archives and Manuscripts* 27 (1999), pp. 54–61; Eric Ketelaar, "Tacit Narratives: The Meanings of Archives," *Archival Science* 1 (2001), pp. 143–55 reprinted in Theo Thomassen, Bert Looper, and Jaap Kloosterman, eds., *Toegang. Ontwikkelingen in de ontsluiting van archieven Jaarboek 2001 Stichting Archiefpublicaties* ('s-Gravenhage, 2001), pp. 68–75.

7 Jacques Derrida, "Archive Fever. A Seminar by Jacques Derrida, University of Witwatersrand, August 1998, transcribed by Verne Harris," in Carolyn Hamilton, Verne Harris, Jane Taylor, Michele Pickover, Graeme Reid, and Razig Saleh, eds., *Refiguring the Archive* (Dordrecht, Boston, and London, 2002), pp. 38–80, here 46; Jacques Derrida, *Archive Fever* (Chicago and London, 1996), p. 17.

onds, instead of the days, weeks, or even months in the past.[8] Numerous tacit narratives are hidden in categorization, codification, and labelling. All these technologies are, to paraphrase Baudrillard, "not coefficients but effectors of ideology."[9] They form an intrinsic part of the discourse network, in Kittler's terms. At the heart of every discourse network is remediation: a newer medium takes the place of an older one, borrowing and reorganizing the characteristics of writing in the older medium and reforming its cultural space. As Bolter and Grusin argue, introducing a new media technology does not mean simply inventing new hardware and software, but rather (re)fashioning information and communication networks within their social and cultural contexts.[10] Our historical research tries to identify the contingencies of control through communication and to assess the impact of remediation.

The Control Revolution

The "visible hand" of Adam Smith (1776) was the hand of the market, controlling decisions on production and sales. In the course of the 19th century, with the expansion of markets, the experience and personal knowledge of the merchant and the craftsman proved insufficient. The one man shop and the small family business are making place for big business. Businesses expand in size and geographically, necessitating new instruments of control and communication. The *visible hand* is supplemented and replaced by the *invisible hand* of management, according to Alfred Chandler.[11] Management is dependent on information, both from within the organization, and externally, to span time and place.

From the middle of the 19th century increasing industrial activity, trade expansion, and enlargement of the scope of operations of banks and insurance companies with its attendant larger scale of activity led to what James Beniger has described as a *control revolution.*[12] Company information and communication systems were drastically reorganized. According to Yates, *systematic*

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8 Richard R. John, "Recasting the Information Infrastructure for the Industrial Age," in Alfred D. Chandler and James W. Cortada, eds., *A Nation Transformed by Information. How Information has Shaped the United States from Colonial Times to the Present* (Oxford and New York, 2000), pp. 55–105; Anthony Giddens, *The Nation-state and Violence. Volume Two of a Contemporary Critique of Historical Materialism* (Cambridge, 1985), pp. 174–78.

9 Quoted in the translators' introduction of Friedrich A. Kittler, *Gramophone, Film, Typewriter* Geoffrey Winthrop-Young and Michael Wutz, trans. (Stanford, 1999), xv.

10 Jay David Bolter and Richard Grusin, *Remediation. Understanding New Media* (Cambridge, Mass. and London, 2000), p. 19.

11 Alfred D. Chandler, *The Visible Hand. The Managerial Revolution in American Business* (Cambridge, Mass., 1977).

12 James R. Beniger, *The Control Revolution. Technological and Economic Origins of the Information Society* (Cambridge, Mass., 1986); Shoshana Zuboff, *In the Age of the Smart Machine. The Future of Work and Power* (New York, 1988).

management, introduced around 1870, and the resulting movement of *scientific management*[13] are the powers that brought about these changes. Formalization, specialization, and depersonalization pulverize the organizational memory, memory once shared. That is why a new organizational memory had to be created in the form of an easily accessible archive, manuals, rules and procedures – and the more so when the company was expanding. The expansion could concern its structure, but also its geographical spread: departmental stores and banks with their branches, and multinationals, like the Dutch mining company Billiton (when it created subsidiaries in various parts of the Netherlands Indies, it felt the need for a central archive that would include the records regarding management matters of its subsidiaries).

New and higher standards of administration and reporting are required, while the volume of incoming and outgoing information is steadily increasing because of industrial expansion. Various new office techniques for the production, reproduction, and keeping of records and for data production are widely introduced. The office is becoming an "innovation junction" of technologies, more or less in tune with each other and used together.[14] They create new functions and a new office hierarchy that is reflected in office buildings, layout, and furnishing.

Yates, Chandler, and other American authors have concentrated their research and publications about office innovation on industry and commerce. However, bureaucracies with their dependency of recorded information were to flourish first in public administration. Innovation in office management sometimes started there, before being taken over by private enterprise. Herman Hollerith's punched cards were first used by governmental census bureaus both in the U.S. and in The Netherlands (1916[15]), before insurance and railroad companies discovered them. When Hendrikus Colijn in 1914 became managing director of the Bataafsche Petroleum Maatschappij (later Royal Dutch/Shell), he introduced methods for information processing with which he had been familiar as a civil servant in the Dutch East Indies and as cabinet minister. Such transfer of innovation between public and private sectors was stimulated by the osmosis of public and private interests, actions, and management systems. This happened in Germany much later, in the thirties,

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13 Erik S.A. Bloemen, *Scientific Management in Nederland 1900–1930* (Amsterdam, 1988); Onno de Wit and Jan van den Ende, "The Emergence of a New Regime: Business Management and Office Mechanization in the Dutch Financial Sector in the 1920s," *Business History* 42 (2000), pp. 89–91.

14 Onno de Wit, Jan van den Ende, Johan Schot, and Ellen van Oost, "Innovation Junctions. Office Technologies in the Netherlands, 1880–1980," *Technology and Culture* 43 (2002), pp. 50–72.

15 And not 1919 as in most literature. See J. van den Ende, *Knopen, kaarten en chips. De geschiedenis van de automatisering bij het Centraal Bureau voor de Statistiek* (Voorburg and Heerlen, 1991), pp. 22–23.

when the *Deutsches Institut für wirtschaftliche Arbeit in der öffentlichen Verwaltung* (DIWIV) (German Institute for Economical Work in Public Administration) joined forces with the *Ausschuß für wirtschaftliche Verwaltung (*Committee for Economical Administration in Business and Industry), one of the results being a joint publication (1931) on record-keeping in the private and public sectors.

In The Netherlands and Germany existing municipal services are since the 1870s being modernized and new ones come into being as a result of industrial and urban development. In 1897 Dutch local councils got the permission to make a profit with utility companies. Thus a large number of municipal telephone, gas, and electricity companies are started up, sometimes because of municipalization of former private concessions. The Dutch state entered the domain of state enterprise, first with railroads (1860), later with inter-urban telephone (1897), mining (1901), etc. For an enterprising government the classical methods of organizing information, accounting, and controlling were not sufficient, however. New legislation (1909/1912) allowed municipal and state enterprises to have commercial accounting systems.[16]

Both in The Netherlands and in Germany municipal companies and state companies led the way in *scientific management.* They proudly showed their innovations at national exhibitions that drew a great number of visitors: they were shop windows for management innovation.[17] The Exhibition on municipal office management in Dresden (Germany) in 1903 awarded a prize to Michalski for his manual on municipal record-keeping.[18] The first Dutch exhibition was organized in 1896 by the Dutch Association for municipal interests, a second one in 1906 by the Dutch Association of municipal civil servants. At the Amsterdam exhibition, in 1906, typewriters were the main attraction. The importer of the Hammond advertized that the cities of Amsterdam and Rotterdam had already bought eighteen Hammond typewriters. The city of 's-Hertogenbosch had eight Adler typing machines. Twelve other municipalities possessed the more expensive Oliver typewriter, Utrecht even two.

Other office machines were gradually introduced. At the 1906 exhibition the city of Zaandam proudly presented its cash register, while Rotterdam showed a vote counting machine. The 400 visitors who daily flocked into the

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16 Jan C.M. van den Ende, *The Turn of the Tide. Computerization in Dutch Society 1900–1965* (Delft, 1991), pp. 62–75.

17 Nico Randeraad, "Een etalage van bestuurlijke vernieuwing, De tentoonstelling op gemeentelijk administratief gebied in 1906," *Amstelodamum* 82 (1995), pp. 141–51; Eric Ketelaar, "Record-keeping Systems and Office Technology in Dutch Public Administration, 1823–1950," *Jahrbuch für europäische Verwaltungsgeschichte/Yearbook of European Administrative History* 9 (1997), pp. 213–22; De Wit and Van den Ende, "The Emergence of a New Regime," pp. 90–91.

18 F. Michalski, *Leitfaden für das Registraturwesen und den allgemeinen Geschäftsgang der deutschen Stadtverwaltungen* (Leipzig, 1904).

exhibition hall were not only interested in these and other office machines (Addressograph, Burroughs Arithometer, Millionär, etc.). In many offices the addressing machine soon became the center of the "organization system."[19] Other innovations, exhibited in 1906, were new filing systems and loose-leaf systems from America and England. Both had, as we will see, their origin in the card index.

The 1906 municipal exhibition already boasted 6000 visitors, the International exhibition of modern office equipment and administration in Amsterdam of 1911, however, showed 16,605 visitors, "how ingeniously the clockwork of administration is constructed and how it is now able to provide the public with all the services they want from it."[20] In 1926, the Amsterdam *Tentoonstelling op het gebied van de openbare en particuliere bedrijfsadministratie* (TOPA for short) (Exhibition of Public and Private Business Administration) brought together public administration and some 30 companies that showed how they had improved their efficiency by better information management.[21] One of the exhibitors was the *Deutsche Kommunalgiroverkehr* (German Municipal Credit Transfer Network). TOPA is paradigmatic for the strength of the network of Dutch "systematizers" in information processing, both in business and in government.[22]

One month before the TOPA, the German Institute for scientific work in public administration (*DIWIV*) was founded in Berlin.[23] One of the features of the institute was a permanent exhibition of office technology: one of the nine exhibition rooms was devoted to records management. *DIWIV* was an initiative of Arnold Brecht, the brain behind the GGO I which was enacted that same year 1926. The GGO I was the *Allgemeiner Teil der Gemeinsamen Geschäftsordnung der Reichsministerien* (General Code of administrative procedure in the German *Reich* ministries), which later would be the basis of the OGHR, *Ordnungsgrundsätze für die Aktenverwaltung der höheren Reichsbe-*

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19 De Wit et al., "Innovation Junctions," pp. 60–61.

20 National Archives, The Hague, Archives of the Ministerie van Economische Zaken, Directie Handel en Nijverheid 1905–1943, nr. 5261.

21 Ibid., nr. 5261–5263; *De Tentoonstelling op het gebied van de openbare en particuliere bedrijfsadministratie T.O.P.A.. 1926,* 3 vols. (Purmerend, 1926); Bloemen, *Scientific Management,* pp. 173–75; M.E.B. van Ophem and M.G.J. Duijvendak, "Mechanisatie op kantoren tussen 1870 en 1930," *Jaarboek voor de geschiedenis van bedrijf en techniek* 1 (1984), pp. 277–87; Van den Ende, *The Turn of the Tide,* pp. 74–75.

22 Nodes in this network were organizations such as The Netherlands Institute for Documentation and Filing (NIDER) founded 1921, the Dutch Institute for Efficiency NIVE (1925), and the Research Group for Modern Office Technology STUMOKA (1927). See De Wit et al., "Innovation Junctions," p. 59.

23 On the German *Büroreform,* see Menne-Haritz, *Geschäftsprozesse,* pp. 133–241; Menne-Haritz, *Business Processes,* pp. 83–96; Hoffmann, *Behördliche Schriftgutverwaltung;* Vissmann, Akten, pp. 269–99; Miller, "The German Registry," pp. 52–58.

hörden (Files Control Code of the central agencies of the *Reich*) (1932).[24] The GGO and the OGHR embodied the *Büroreform* (office reform) which had been on the agenda of the Prussian administration between 1909 and 1917 and which had been prepared by the administration of the *Reich* since 1921, when thirty-seven-year-old Arnold Brecht was appointed head of the section for constitution, administration, and civil service of the Ministry of the Interior. Both reform movements, the Prussian one and the one of the *Reich*'s administration, were linked, not the least because Brecht adopted much from the writings of Bill Drews, who had been the Prussian commissioner for administrative reform and who later became director of *DIWIV.*

The *Büroreform* of the 1920s is the triumphal march of a misunderstanding – thus begins one of the chapters of Angelika Menne-Haritz' recent book on business processes in public administration.[25] The *Büroreform* was on the whole a reform of public administration, but with a great emphasis on records management. As Arnold Brecht – who in 1933 fled from the Nazis to the U.S. – wrote "Of all the parts of a German ministry, the section which was subject to the most particular attention on the part of the reformers was the record and filing system."[26] To some extent the *Büroreform,* as the American and Dutch reform movements, relied on scientific management, but its focus was restricted to *Aktentaylorismus.* Precisely there was the root of the misunderstanding to which Menne-Haritz refers. The objective of the *Büroreform* was not so much improving control through communication, but improving control through bureaucratic individualization. The individual civil servant reigning over his own discrete domain, was liberated from the straight jacket of the *Registratur* (registry system). *Registratur*-free work was one of the central tenets of the *Büroreform.* This was attempted through the introduction of the *Bearbeiterablage* (filing not by the registry, but by the civil servant himself) and abolishing the centrally-kept *Tagebuch* (daily ledger) as the main instrument of control. The panoptic control from a central point by the registry, with the *Tagebuch* as a process steering mechanism was replaced by the "intime Umgang mit Akten" (intimate dealing with the files) by the self-governing civil servant, connected with his colleagues by the chain of documents all running "by themselves" (*Selbstlauf*), following the routing indications put on the document or its folder – red for "urgent matters," yellow for "immediate matters," etc.[27] Filing as an instrument of control of government business was

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24 The main part of Arnold Brecht and Comstock Glaser, *The Art and Technique of Administration in German Ministries* (Cambridge, Mass., 1940), pp. 45–167, is an English translation of the GGO I. The book was used by the U.S. military during and after the Second World War as a main source for understanding German public administration: Vismann, *Akten,* p. 289.

25 Menne-Haritz, *Geschäftsprozesse,* p. 133.

26 Brecht and Glaser, *The Art and Technique,* p. 32.

27 Vismann, *Akten,* pp. 287–88; Brecht and Glaser, *The Art and Technique,* pp. 142–43.

replaced by filing as clearing away, *aufräumen.* As Thea Miller remarks "Under the guise of Germanification the term *Registratur* (registry) was replaced by *Aktei* (filing room), as if the registry was about managing files (rather than business matters)." And she adds: " ... this conceptual shift continues to dog current thinking on the registry in Germany."[28]

Internal Communication

For the management of a company, new genres and new technologies came into being. Yates distinguishes *downward communication, upward reporting*, and *internal correspondence.*[29] As in America, the railroads in Germany and The Netherlands were leading the innovation of record-keeping.[30] Yates points out the consequences of the physical characteristics of railway companies for management and communication. To attune activities that are coupled in time and distance, specific management instruments are needed. We have found in The Netherlands that this can also be seen in other process industries such as gasworks, electricity plants, and waterworks. Oral instruction isn't sufficient to induce safe working practices and, moreover, it isn't possible, because of the long distances. Transport companies and multinationals, such as Koninklijke Paketvaart Maatschappij, Billiton, Royal Dutch/Shell, were to experience this as well.[31]

A new organizational memory of rules, regulations, and reporting makes the organization less dependent on individual memories. Reporting isn't new, but new is that form and content are systematized. At first reports had the form of a letter, with a formal beginning and end, but these are replaced by statistic forms and tables that have to be completed, forms that are important for *systematic management.* With the introduction of s*cientific management* information is streamlined. The *memo* is born. Information must be read at a glance and is therefore produced in standardized forms, graphs and diagrams, organization charts, and flow charts.[32] The Eerste Nederlandsche Verzekering-maatschappij, an insurance firm, invented a system of "moving letters": forms indicating in a flow chart all actions to be taken with regard to one insurance policy and all documents to be checked. These forms moved through the office from department to department, from desk to desk.[33] These and other forms and charts were a main attraction at the TOPA exhibition. The data for

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28 Miller, "The German Registry," p. 58.
29 Yates, *Control through Communication,* pp. 65–100, covering also house magazines and meetings for managers; we studied these genres too.
30 Hoffmann, *Behördliche Schriftgutverwaltung,* pp. 30–31.
31 J.N.F.M. à Campo, *Engines of Empire. Steamshipping and State Formation in Colonial Indonesia* (Hilversum, 2002), pp. 420–21, 580–81.
32 Yates, *Control through Communication,* p. 91.
33 *De Tentoonstelling* 1, pp. 195–98.

the graphs and charts came from the financial administration (and Taylorian time registration), its role having changed from traditional bookkeeping. The financial administration became a controlling instrument, enabling systematic analysis of production processes and methods.[34] Carbon paper together with loose-leaf account books enabled simultaneous recording and posting of financial transactions. These technologies, in combination with writing counting machines, writing bookkeeping machines (the first of these is seen in The Netherlands in 1913[35]), and punched cards drastically improved administrative management and accounting in Dutch commercial and public enterprise in the 1920s and 1930s.

Production of Documents

Innovation in record-keeping can be measured above all by the way an organization produces and keeps its records. Analogous to old Dutch law, the commercial code (1838) required the merchant to keep a journal, to keep the letters received, to make a *kopijboek* (copying book) of outgoing mail, and to make up an inventory and balance sheet at the end of each year. Such "merchants' books" could be used as legal evidence. For the *kopijboek* one had the choice between entering data in a letter book or letter press copying.[36] The letter press was already known in the 18th century (George Washington received one from Holland in 1782[37]), but it is only in the middle of the 19th century that the letter press is commonly used. Copying books and letterpress books could be used simultaneously in an office, as is shown in the case of Fijenoord shipyard in Rotterdam. As of 1855 they use press books for labour-intensive work such as budgets and quotes, next to hand-written copying books.[38] All books have a chronological order. Series are made when books are being split off. Not only did Fijenoord have an ordinary copy book, it also had one for its mechanical engineering work and separate copy books for special clients, for example the Ministry of Colonial Affairs 1835–1842, and the Ministry of Naval Affairs 1845–1855. In this way they circumvented the disadvantage of

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34 M.S.C. Bakker, "Beheerst innoveren," in J.W. Schot, H.W. Lintsen, A. Rip, and Albert de la Bunhèze, eds., *Geschiedenis van de techniek in Nederland. De wording van een moderne samenleving 1800–1890,* vol. 6 (Zutphen, 1995), pp. 78–84; Van den Ende, "Kantoor en informatietechnologie," p. 223; Francis X. Blouin, "A New Perspective on the Appraisal of Business Records: A Review," *American Archivist* 42 (1979), p. 319.

35 Van den Ende, "Kantoor en informatietechnologie," p. 249.

36 Barbara Rhodes and William W. Streeter, *Before Photocopying. The Art and History of Mechanical Copying 1780–1938* (New Castle, Del. and Northampton, Mass., 1999); Yates, *Control through Communication,* pp. 26–28; Barbara L. Craig, "The Introduction of Copying Devices into the British Civil Service, 1877–1889," in Barbara L. Craig, ed., *The Archival Imagination. Essays in Honour of Hugh A. Taylor* (Ottawa, 1992), pp. 105–33.

37 Rhodes and- Streeter, *Before Photocopying,* p. 10.

38 City Archives, Rotterdam, Archives Fijenoord, nrs. 82–84, 89, and 118–23.

the bound record system that enabled only one person at a time to work with a volume.[39]

In 1882 production of the first German typewriter *Hammonia* began. In 1883 the Remington typewriter came into the Dutch market. Other makes follow rapidly. We know that before 1900 only four Dutch ministries (Justice, Interior, War, Commerce and Industry) used typewriters: in the 1880s and early 1890s only occasionally, increasingly after 1899.[40] In Germany the War Ministry was in 1896 the first ministry to use the typewriter. German public administration on the whole, however, resisted the typewriter, until, as a consequence of the war, many of the civil servants who were sent to the front, were replaced by civilians who were accustomed to using the typewriter in business. According to Vismann the typewriter became the standard tool in German public administration in the 1920s.[41]

With the typewriter women entered public administration, not as civil servants, but as paid workers.[42] Around 1900, in The Netherlands, the price of a typewriter equaled a quarter of the annual salary of an experienced male clerk in a ministry. Female typists were cheaper – one of the reasons behind the so-called feminization of office work: the number of female clerks in The Netherlands rose from 410 in 1899 to 36,825 in 1920 (= 24.2 per cent of all office clerks).

Reproduction of Documents

The introduction of the typewriter did not immediately lead to the abolition of the letterpress book. For some time handwritten copies and typewritten copies are found in one and the same letterpress book. But the chronological order in letter books and copying books was like a straightjacket: it severely restricted their use. Outgoing letters couldn't be traced quickly for one thing. Then there was the need to make files, which necessitated the reproduction of copies that had been bound into a book. One of the answers was the mechanization of the

39 Charles W. Wootton, and Carel M. Wolk, "The Evolution and Acceptance of the Loose-leaf Accounting System, 1885–1935," *Technology and Culture* 41 (2000), pp. 82–83.
40 Ketelaar, "Record-keeping Systems," p. 217; De Wit et al., "Innovation Junctions," p. 56.
41 Vismann, *Akten,* p. 273.
42 Graham S. Lowe, "Women, Work and the Office: The Feminization of Clerical Occupations in Canada, 1901–1931," *Canadian Journal of Sociology* 5, no. 4 (1980), pp. 361–81; Graham S. Lowe, "'The Enormous File': The Evolution of the Modern Office in Early Twentieth Century Canada," *Archivaria* 19 (Winter 1984–1985), pp. 137–51, reprinted in D. McCallum, ed., *The Development of Canadian Capitalism: Essays in Business History* (Toronto, 1990), pp. 256–72; Margaret L. Hedstrom, *Automating the Office: Technology and Skill in Women's Clerical Work, 1940–1970* (Ph.D. dissertation, University of Wisconsin, 1988); Francisca de Haan, *Gender and the Politics of Office Work, The Netherlands, 1860–1940* (Amsterdam, 1998); Bernhard Siegert, *Relays. Literature as an Epoch of the Postal System* (Stanford, 1999), pp. 193–94; Vissmann, *Akten,* pp. 273–74.

copying book method by the roller copying press. Carbon copies offered even more possibilities, however.[43] The carbon copy and the ribbon copy were made simultaneously, cutting out the need to copy a letter at a later stage. Carbon paper was used already for a long time (in 1806 Ralph Wedgewood patented his *Stylographic* writing machine) but its use became widespread only after the introduction of the typewriter. Where, as in Germany, the typewriter became a standard only late, carbon paper was late too. As late as 1910 German public administration only very rarely used carbon paper.[44]

Other reproduction methods appeared to be necessary when more copies were needed than one could make in one go with carbon paper: hectograph duplicators and stencil duplicators.[45] For "unplanned copying after the point of creation" photocopying is used after 1900.[46] In the new office of life insurance company Utrecht (1902) a special room was made to photograph documents, in all probability with a German Kontophot.[47] It was only in 1921 that the Nederlandsche Bank ordered such a machine.

Storage and Retrieval

The Dutch commercial code did not specify a method for filing incoming letters, but in France the *Code de Commerce* required filing in bundles tied by a string. In America and England folding incoming letters, docketing, and storage in pigeon holes were common methods. Hope & Co, a Dutch bank with English leanings, used the latter method. Later on box files, fitting the copying books and letterpress books, came into use. Around 1868, America-based Amberg introduced cabinets for flat filing. The German firm of Stolzenberg manufactured similar cabinets for the European market.

An alternative since the eighties was the arch file or Shannon file, which held papers horizontally, fastened by clasps. The Shannon file inspired German Louis Leitz (who since 1871 manufactured the *Biblorhapte,* a mechanical binder) to make his Leitz *Ordner,* an arch file, book-wise standing vertically.[48] In 1896 Leitz invented the lever at the outer side of the arches, in 1904 he produced the first punch, in 1911 the pull-hole in the back of the file, thus perfecting the *Stehordner.* As early as the 1880s, Leitz and Soennecken files were

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43 Yates, *Control through Communication,* pp. 45–50; Rhodes and Streeter, *Before Photocopying,* pp. 124–28.

44 Vismann, *Akten,* p. 274.

45 Yates, *Control through Communication,* pp. 50–54; Van den Ende, "Kantoor en informatietechnologie," pp. 222, 229–30; Rhodes and Streeter, *Before Photocopying,* pp. 123–67.

46 Yates, *Control through Communication,* pp. 54–56.

47 Jacques L.J.M. van Gerwen and Nico H.W. Verbeek, *Voorzorg & de vruchten. Het verzekeringsconcern AMEV: zijn wortels en vertakkingen van 1847 tot 1995* (Amsterdam, 1995), p. 71; Van den Ende, "Kantoor en informatietechnologie," p. 231.

48 Vismann, *Akten,* pp. 276–88.

imported in The Netherlands. German public administration, however, for a very long time kept to the centuries-old tradition of sewing the files (*Aktenheftung*) and storing the files horizontally.[49]

The genealogy of the *Stehordner,* according to Vismann who treats the method extensively, goes back to the card index. Markus Krajewski has recently narrated the history of the card index and its American promoter Melvil Dewey.[50] From around 1889 the American Library Bureau, led by Dewey, succeeded in selling its index system methods, designed for library catalogues, to insurance companies and other firms.[51] As in the U.S., Dutch insurance companies were the first to use index systems on a large scale (Levensverzekeringsmaatschappij Utrecht, 1905).[52] Next to these systems for customers' administration, the use of bound files (copying books, ledgers, etc.) remained standard practice. The age-old regulation (in The Netherlands as well as in Germany) required a merchant to keep a journal and a copying book in book-form. For a long time loose-leaf systems imitated the bound volumes that had been in use for a long time.[53]

Elaborating on their index system, the Library Bureau designed the vertical file (1893), replacing flat files (stored horizontally in cabinets) and the book-like box files.[54] Vertical filing systems and the whole range of connectable filing cabinets doubled the sales of the Library Bureau. They did, not however, only sell the hardware, but also the software: filing and index systems, including decimal systems based on the library code invented by Melvil Dewey. What Dewey did for America, Johan A. Zaalberg did for The Netherlands.[55] In 1890 Zaalberg became council clerk of Zaandam. He began with clearing the mess of the chronologically arranged 19th century records. For the future, he thought a new filing system a necessity. Looking for examples, Zaalberg got hold of the German "catechism" of records and archives management, describing the *Sachaktenregistratur* used since the

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49 Brecht and Glaser, *The Art and Technique,* p. 174.

50 Krajewski, *Zettelwirtschaft,* pp. 99–144.

51 Gerri L. Flanzraich, *The Role of the Library Bureau and Gaylord Brothers in the Development of Library Technology, 1876–1930* (Ph.D. Thesis, Columbia University, 1990); Gerri L. Flanzraich, "The Library Bureau and Office Technology," *Libraries & Culture* 28 (1993), pp. 403–29.

52 Van Gerwen and Verbeek, *Voorzorg & de vruchten,* p. 76.

53 Wootton and Wolk, "The Evolution and Acceptance of the Loose-leaf Accounting System," pp. 80–98; Krajewski, *Zettelwirtschaft,* pp. 155–58.

54 Alan Delgado, *The Enormous File. A Social History of the Office* (London, 1979), p. 68; Yates, *Control through Communication,* pp. 56–63.

55 Ketelaar, "Record-keeping Systems"; Eric Ketelaar, "Zaalberg en Otlet: een hoofdstuk uit de geschiedenis van Belgisch-Nederlandse innovatie op archiefgebied," in Gustaaf Janssens, Griet Maréchal, and Frank Scheelings, eds., *Door de archivistiek gestrikt. Liber amicorum prof. dr. Juul Verhelst* (Brussel, 2000), pp. 157–64.

18th century: documents concerning one subject were bound in one file; these files were arranged according to a systematic filing plan (*Registratur-plan*).[56] To replace the traditional sewing of files, the German firm Stolzenberg was marketing file covers with a *Schnellhefter* (mechanical binder). These Stolzenberg files were imported – at least since 1898 – in The Netherlands by the Amsterdam firm of F.W. Salomons. Early 1900 Zaalberg saw such a Stolzenberg file. Salomons referred Zaalberg to the towns of Colmar and Muhlhausen in the Alsace (at that time a German territory), where he asked for information on the filing system as described by Michalski in his prize winning manual, mentioned earlier. Following this German system, the Zaandam records were rearranged, using the Stolzenberg files. These were stored horizontally in drawers in filing cabinets manufactured by Stolzenberg. The drawers and the files were accessible via a filing plan. All documents were registered in a daily ledger, which Zaalberg named the *indicateur*.

It seems strange that German classic records management had such an influence in The Netherlands at a time when in Germany the *Büroreform* was proposing to do away with the same methods. Zaalberg referred, in his 1908 book *Het nieuwe registratuur-stelsel bij de gemeente-administratiën* (The New Filing System in Municipal Administration) to German critics, like Julius Hanauer, and he concluded that the question whether the *Tagebuch* or *indicateur* really could be disposed of, was yet to be settled.[57] Zaalberg furthermore deviated from the Michalski-system by giving a new function and a new form to what Zaalberg called the index or filing plan. Zaalberg's index is not a German *Registraturplan,* but an *Aktenplan* (filing plan). The former registers the result of actions; the latter is a "forward-looking" (*Vorausschauend*)[58] arrangement of functions and subjects preceding the actual filing. Zaalberg described his index as "the classification table of all administrative subjects with which government is related. To each subject a number is assigned, always the same, representing the subject. This index is a so-called card-index."[59] The form of the files was borrowed from the German *Sachaktenregistratur.* The *form* of the *Aktenplan* and *Tagebuch* – the card index – Zaalberg derived from an idea of J.C. Beth, working in the National Archives in The Hague. Their *function* and *structure,* however, were inspired by Paul Otlet in Brussels.

Otlet had founded in 1895, with Henri Lafontaine, the Institut international

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56 Georg Holtzinger, *Katechismus der Registratur - und Archivkunde* (Leipzig, 1883).

57 Johan A. Zaalberg, *Het nieuwe registratuur-stelsel bij de gemeente-administratiën* (Amsterdam, 1908), p. 16.

58 Angelika Menne-Haritz, *Schlüsselbegriffe der Archivterminologie* (Marburg, 1992), p. 34.

59 Zaalberg, *Het nieuwe registratuur-stelsel,* p. 17.

de bibliographie (IIB).[60] The main goal was putting together a universal bibliographic repository: an enormous card index of abstracts (ultimately fifteen million cards!) of all books and all journal articles published all over the world since the invention of the printing press. This repertory would make accessible the whole of the scientific, literary, and artistic production of all time and in all countries. For the arrangement of the cards (on the standard format propagated by Dewey) the IIB used Dewey's decimal code, created between 1873 and 1876. Otlet and Lafontaine expanded Dewey's code with signs for the relations between concepts, etc. Thus was developed the Universal Decimal Classification (UDC), the first edition being published between 1899 and 1905.

Otlet propagated this code not only for use in libraries, but also for the classification of files.[61] Like Zaalberg, Otlet had been impressed by the German filing system and the American card indexes, while favouring vertical filing. Otlet in his turn inspired William H. Williams, who, after a visit to Brussels, reorganized the filing system of the Baltimore and Ohio Railroad Company along the lines of Otlet's ideas; many American railroads adopted the Williams-Otlet system.[62] Zaalberg, who studied Williams' book as well, wholeheartedly acknowledged the German, Austrian, Belgian, and American origins of his system, when explaining his ideas in a lecture at the 1908 IIB International Congress on bibliography and documentation, where Zaalberg and the mayor of Zaandam, C.E. Elias, formed the Dutch delegation. At Otlet's request, Zaalberg arranged for the foundation of the Vereeniging Nederlandsch Registratuur Bureau, NRB for short (Dutch Filing Bureau Association) in 1909. Zaalberg and the NRB promoted the new filing system and stimulated a number of municipalities and companies that had joined the NRB, to reorganize their records management.[63] In 1909 Zaalberg established a joint venture with Blikman and Sartorius, a firm of importers and manufacturers of office equipment.[64] The imports of this firm included Walker's loose-leaf books

60 W. Boyd Rayward, *The Universe of Information. The Work of Paul Otlet for Documentation and International Organisation* (Moscow, 1975), pp. 160–65; Andrée Despy-Meyer et al., eds., *Cent ans de l'Office international de bibliographie* (Mons, 1995).
61 Paul Schneiders, *De bibliotheek - en documentatiebeweging 1880–1914; bibliografische ondernemingen rond 1900* (Amsterdam, 1982); Ketelaar, "Zaalberg en Otlet"; Krajewski, *Zettelwirtschaft,* pp. 133–44.
62 Yates, *Control through Communication,* p. 59.
63 In 1907 the Society of Dutch Archivists adopted a motion (drafted by Fruin) declaring the Zaalberg system to be contrary to rule 2 of the 1898 *Manual for the Arrangement and Description of Archives* by Muller, Feith, and Fruin: an archive is an organic whole. In 1915, however, Muller repented and even recommended the record-keeping system of the *Registratuurbureau:* Schneiders, *De bibliotheek - en documentatiebeweging,* pp. 162–63. See also the Society's journal *Nederlandsch Archievenblad* 14 (1905–1906), pp. 143–44; 15 (1906–1907), pp. 66–68; 16 (1907–1908), pp. 16–28; 17 (1908–1909), pp. 106–16; 23 (1914–1915), pp. 43–49, 171–90; 24 (1915–1916), pp. 5–8, 11–13, 90–97; 25 (1916–1917), pp. 89–96; 62 (1957–1958), pp. 103–106.
64 National Archives, The Hague, Archives Registratuurbureau 1909–1976, nr. 1.1.

from England and the Leitz *Stehordner*. At the 1906 exhibition, Blikman and Sartorius won a gold medal for their loose-leaf systems. The following year they introduced the Fortuna card index and vertical filing system, the first such system made in The Netherlands. The hardware, together with Zaalberg's case filing system with decimal classification, was marketed in The Netherlands and The Netherlands East Indies.

The economy of the East Indies was controlled by big companies with head offices in Amsterdam and The Hague. Communication was essential for controlling their business overseas. The Dutch mining company Billiton set up a filing system for their Netherlands East Indies' office that was a mirror of the system in the Hague headquarters. When Royal/Dutch Shell reorganized the administration of its offices in The Hague and in the Netherlands East Indies between 1916 and 1924, the oil company contracted Zaalberg. In 1916 the The Hague Shell office and Shell/Anglo Saxon agreed on uniformity of their correspondence files. Another example of international cross-fertilization were the study visits and audits by the members of the Association of International Department Stores (ADS), founded in 1928 (Harrods in London, Le Printemps in Paris, Bijenkorf in Amsterdam, Leonhard Tietz [since the *Entjudung* "purge"of Jewish business) in 1933 Westdeutsche Kaufhof], etc.). In 1932 the Bijenkorf reorganized its administration to meet the standards of *scientific management* proposed by its ADS colleagues.

The NRB was taken over by the Vereeniging van Nederlandsche Gemeenten, or VNG (Association of Dutch Municipalities) in 1922 and a new VNG Registratuurbureau (records management bureau) was set up. Zaalberg, the idealistic and persistent promoter of case files and the UDC, had to hand over its management to his former associate, the practical and tactful P. Noordenbos. The VNG Registratuurbureau took over the NRB contracts with fifty-two municipalities and managed to raise the number to 312 in ten years. At the outbreak of the Second World War the VNG filing system was used in 657 municipalities.

Remarkably the whole movement of reorganizing filing systems before the Second World War did not touch the Dutch ministries and central agencies. Central government in The Netherlands lagged behind, just as in Germany where innovations in municipal administration preceded development in the ministries.[65] It was not until 1925 that decimal classification of the filing plan was introduced in Germany, not in the way Otlet and Zaalberg foresaw, but with the so-called four digits-system. Unlike the flexible UDC, the four digits-system did not allow expansion: it froze, so to say, the functions of government. After the war, Dutch records managers imported UDC-based filing sys-

65 Ketelaar, "Record-keeping Systems," pp. 220–22; Hoffmann, *Behördliche Schriftgutverwaltung,* p. 30; Menne-Haritz, *Geschäftsprozesse,* pp. 167–70.

tems in international organizations such as UNESCO and the European High Authority for Coal and Steel, one of the predecessors of the EU.[66]

For the innovation in storage and retrieval of documents, the typewriter, but above all carbon paper, has been essential.[67] Typewriter, carbon paper and loose-leaf filing systems constituted an "innovation junction." The fast production of reliable copies of outgoing papers (to be stored according to subject) and easy access to subject files meant that the record-keeping system could regain its function of organizational memory, or – as Billiton records manager, Miss Nel Lefèbre, wrote in 1928 – *intelligence office.*

But record-keeping wasn't restricted to correspondence. In the Dutch Rotterdamsche Bank Vereeniging (Robaver), undisputed leader in office mechanization in the 1920s, the difference between bookkeeping, administration and statistics disappears,[68] and in many companies the administrative organization is to become a data producing factory, even having the lay-out of a factory. Government offices have a similar lay-out: when, in 1939, the city of Utrecht introduces the registration of personal data on index cards, they use a flow chart to place desks and cabinets in such a way that the civil servants can do their work efficiently, according to the workflow.[69]

New People

One of Yates' findings is that "the single factor immediately related to the emergence of communication as a managerial tool was the intervention of a strong manager championing the new theories."[70] In our studies we also encountered "strong men," next to one outstanding woman. The men mostly belonged to the class of the committed managers mentioned by Yates, the woman is an exceptional representative of the *systematizers* in record-keeping and documentation. Their jobs were very similar to those of organization and efficiency advisers – new professions of specialists in office organization and administration, whose predecessors were accountants or who came out of the accounting profession themselves.[71] In our case studies we often found the same names of records managers and consultants who introduced the new system in various companies and organizations.

The people who developed the methods, techniques, and systems could

66 Jean-Marie Palayret, "Quelle filiation historique pour les archives historiques de l'Union européenne," *Gazette des archives* 192 (2001), pp. 69–70.
67 De Wit et al., "Innovation Junctions," pp. 57–58.
68 Van den Ende, "Kantoor en informatietechnologie," pp. 255–60; De Wit and Van den Ende, "The Emergence of a New Regime," pp. 87–188.
69 Van den Ende, "Kantoor en informatietechnologie," p. 259.
70 Yates, *Control through Communication,* p. 273.
71 Bloemen, *Scientific Management;* Van den Ende, "Kantoor en informatietechnologie," pp. 212, 234, 242–47.

only succeed if the users cooperated.[72] New methods and new technology are important impulses for archivalization,[73] but in themselves they are insufficient for a fundamental change in records management. Quite rightly the model developed by Everett Rogers shows that acceptance in a social system is one of the most important factors for the dissemination of innovations.[74] This social system is partly determined by the culture of the organization. Research on people and their organizational culture in past and present can help formulate theories about effective and efficient records creation and management.[75] That is the societal mission of archival science.

Conclusion

Our research has proven the usefulness of Yates' *Control through Communication* as a framework for comparative archivistics, and, moreover, confirmed most of Yates' conclusions. Technology was an enabling and promoting actor, not the primary cause of innovation. Committed managers played an important role in introducing new communication technologies. In our research we found that the network of records management specialists was equally important. In American firms the major elements of the modern communication systems had already been established by 1920 and by then communication had a function as a tool for managerial control. In The Netherlands many of the American methods and techniques were adopted between 1880 and 1930, with the first introductions arriving around 1870 and the last around 1940. Many innovations came to The Netherlands from or via Germany and other European countries (England's role as an intermediate between the U.S. and The Netherlands has still to be examined) and were then further developed from The Netherlands through international networks in other parts of the world. We think the international scope of innovations in record-keeping deserves further research.

Understanding the contingencies in the history of control through communication is important because "all forms of communication are loaded with conventions and semiotic 'signs' inherent in their respective technologies"

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72 Van den Ende, "Kantoor en informatietechnologie," p. 214.

73 Ketelaar, "Archivalisation and Archiving"; Eric Ketelaar, "Archivistics Research Saving the Profession," *American Archivist* 63 (2000), pp. 328–29.

74 Everett M. Rogers, *Diffusion of Innovations* (New York, 1995). See Edward Higgs, "The Determinants of Technological Innovation and Dissemination: The Case of Machine Computation and Data Processing in the General Register Office, London, 1837–1920," *Jahrbuch für europäische Verwaltungsgeschichte/Yearbook of European Administrative History* 9 (1997), pp. 161–77.

75 Frank G. Burke, "The Future Course of Archival Theory in the United States," *American Archivist* 44 (1981), pp. 42–43; Ketelaar, "Archivistics Research Saving the Profession."

which have an impact on the creation, maintenance, and use of records.[76] Such understanding may also contribute to our comprehension of current and future remediation, involving the adaptation and reorganization of handed down technologies that affect record-keeping and its social and cultural contexts.

76 Taylor, "'My Very Act and Deed,'" p. 456.