

THE LIBRARY QUARTERLY

Volume 79

JANUARY 2009

Number 1

CULTURAL DIMENSIONS OF DIGITAL LIBRARY DEVELOPMENT, PART II: THE CULTURES OF INNOVATION IN FIVE EUROPEAN NATIONAL LIBRARIES (NARRATIVES OF DEVELOPMENT)¹

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This article presents the narrative accounts of the beginnings of digital library programs in five European national libraries: Biblioteca nacional de Portugal, Bibliothèque nationale de France, Die Deutsche Bibliothek, the National Library of Scotland, and the British Library. Based on interviews with policy makers and developers of digital libraries, this qualitative study examines the influence of culture and local practices during the first wave of development, between 1998 and 2002. The cultural dimension of digital library development is related to organizational structure, technology, and national context for each of the national digital library programs. The analysis identifies distinct models of development, institutionalization time lines, and a repertoire of constructivist approaches to digital library innovation in each of the national libraries. Part I presented institutional histories, methodology, and the theoretical framework guiding analysis and interpretation.

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1. The author would like to thank the participants in the study for their time and insights. Without them, this study would not be possible. Thanks also go to Alan Danskin, Gordon Dunsire, Martine Poulain, and Mirna Willer, who helped in the recruitment effort. For reading and commenting on a draft of this manuscript, the author would like to thank Anselm Spoerri. This research has been completed with support from Rutgers University 2001 Research Council grant 2-02017 for “Global Processes and Localization Strategies: A Cross-Cultural Study of National Digital Library Projects.” This article is Part II of a two-part series. The first part, entitled “Cultural Dimensions of Digital Library Development, Part I: Theory and Methodological Framework for a Comparative Study of the Cultures of Innovation in Five European National Libraries,” was published in the October 2008 issue of the *Library Quarterly* (78 [4]: 355–95).
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[*Library Quarterly*, vol. 79, no. 1, pp. 1–72]

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0024-2519/2009/7901-0002\$10.00

Introduction

The research context for this study is a historical juncture of digital library innovation at the tail end of the first wave, from the mid-1990s until 2002. During that time, libraries were defining their relationship to the new medium for circulating and presenting their collections and were completing large-scale digitization projects that brought a critical mass of historical materials online. This first wave of digital library development has not been researched from the point of view of the local cultures of innovation or in relation to heritage management. Because national libraries are primary institutional contexts shaping national memory in the context of a transnational global culture, they can model the cultural imperative to drive digital history and digital innovation. This account explores how five European national libraries launched their national digital programs.

The case studies of Biblioteca nacional de Portugal (NLP), Bibliothèque nationale de France (BNF), Die Deutsche Bibliothek (DB), the National Library of Scotland (NLS), and the British Library (BL) offer an insight into the institutionalization of digital programs in national libraries. They build on an earlier two-part study of the National Digital Library Program (1995–2000) at the Library of Congress [1, 2] (presented in two complementary articles, as theory and narratives of development). This previous research explored the construction of meanings around digitization and American Memory (the public face of the National Digital Library Program), to reconstruct institutional processes and the history of innovation from the point of view of the digital projects' team members. The theoretical framework developed in that study combined constructivist, historical, and phenomenological approaches for the analysis of innovation, using social construction of technology (SCOT) and theories of organizational rationality. Its findings were about modalities of successful innovation and synthesis of a constructivist history of innovation.

The shift of focus in the present study is to a comparative culturalist orientation that is complementary to the previous studies in exploring the first wave of digital library development in national libraries. Therefore, some aspects of the theoretical framework and findings about innovation and organizational change are carried over. Nevertheless, the data of that previous study are not combined with the data from the five cases discussed here. The analysis presented here complements and extends the historical exploration of a significant period of innovation in libraries presented in the initial studies while it explores the dimension of culture and the question of variability.

The main research objective was to understand how digital libraries are

built at the national and international levels. Through understanding of such development in five European national libraries, the study seeks to identify the cultural dimension of development, describe the organizational variability at the point of emergence (institutionalization), and study the effects of the Internet in the national library context in the first decade of its adoption.

Although the analysis of cases presented here stands on its own, Part I of this article—which includes brief institutional histories for each of the national libraries, the theoretical framework, the methodology of data collection, and a summary of findings—provides in-depth discussion of the problem of “culture” and the analytical framework that is implicit in this analysis. Therefore, each part needs the other for full understanding.

The research process was conducted at two levels: (1) qualitative analysis of the narratives of development and (2) modeling—identifying distinctive processes in each of the institutions. These two stages are combined in the “Approach to Analysis” and “Histories of Development” sections, and the “Summary of Findings” section highlights the most distinctive features of each of the cultures of innovation and compares their philosophies of development. Table 1 shows research objectives in relation to analytical frameworks and the data collection instrument.³

The data collection process combined document analysis with semi-structured interviews (a method that fits with the classic approaches to innovation diffusion research) that were conducted with policy makers and digital library developers from the national libraries. The five libraries were selected because of their distinct histories representing varied institutional cultures and because they were coming out of an experimental phase of digital library innovation at the time of the interviews and were transitioning to the process of reflection, were making new institutional arrangements for digital library innovation, and had accumulated a mass of digitized heritage material. The documentary evidence, including secondary sources, was used to establish a baseline chronology for each of the projects and is presented in Part I. In contrast, the perspectives of the study participants presented in the realist accounts of that process help establish an internal institutionalization time line and insight into distinct cultures of innovation in each of these institutional contexts. The participants’ insights provide subjective observations, although they are representative of the institutional points of view that shaped their voices. They presented the official views of their national libraries about technology as a trigger for structural change. The interviews reflect views that were in-

3. Tables 1 and 2 previously appeared in Part I as tables 2 and 6, respectively. They are reproduced almost exactly here, except that citations and wording in the table notes have been modified for Part II.

TABLE 1
RESEARCH OBJECTIVES AND INTERVIEW QUESTIONS IN RELATION TO A THEORETICAL FRAMEWORK

Research Objective	Dimension	Interview Questions	Structure (Loci of Control/ Reasoning Constraints)	Culture Dimension(s)
1. DESCRIBE the participants' self-perception of their roles, their involvement with the digital library project, and their career paths and explicit/implicit indicators of identity concerns related to their roles	Participants	Q1, Q2	Normative pressures (profession), mimetic processes (organization)	Relationships (PDI, IDV), environment (UAI)
2. IDENTIFY cultural dimensions of the process of development in each of the institutions (descriptions of formative events and project landmarks, barriers, negotiation, and conflict resolution)	Processes	Q3–Q5	Mimetic processes (organization)	Relationships (PDI, IDV), environment (UAI)
3. IDENTIFY the contextual contingencies (the organizational field, institutional processes, and client relations with society at large and related institutions)	Context	Q5, Q10, Q14	Coercive isomorphism (society), mimetic processes (organization), normative pressures (profession)	Relationships (IDV)
4. IDENTIFY strategies by which identity concerns are managed through the building of digital repositories of cultural texts and strategies by which national libraries are challenging or reinforcing the hybridization of culture and of extraterritorialization	Identity	Q5, Q7, Q11–Q14	Coercive isomorphism (society)	Environment (UAI), relationships (IDV, MAS)

NOTE.—This analysis selectively uses responses to questions related to the collections and the uses (users) of the digital collections (notably Q6, Q8, and Q9). All questions (Q1–Q14) are reproduced in appendix A. Structure refers to social context—that is, an environment in which the loci of control shape reasoning in the social choice model. Thus, they are referred to as reasoning constraints. As regulative processes, they originate in the external environment and refer to norms of behavior and moral codes in the communities of practice, as well as to the effects of power blocs in the institutional context [3]. Together, they regulate strategy formulation in the organization [4]. Relevant culture dimensions for each of the objectives include external adaptation and internal integration; they are matched to Hofstede's cultural indices (in parentheses) as explained in table 3.

tegral to structured social action as national libraries approached cultural strategy formulation during the digital library boom starting in the mid-1990s.

The interviews were conducted during the International Federation of Library Associations (IFLA) meeting held in Glasgow on August 18–24, 2002, and at the British Library on August 18–23, 2002, in individual sessions with nine participants from the five European national libraries.⁴ As shown in table 2, the study participants were administrators or leaders of digital library initiatives in their institutions. They were identified through a snowball sampling procedure at the annual meeting of the Consortium of European Research Libraries held in Lyon on November 8–9, 2001, which tapped into the social network of librarians from national libraries that assembled at that meeting. Through chain referral within that network, which also included circulation of the study description in the network, the relevant individuals were identified and contacted in advance; others were recruited through referrals at the 2002 IFLA meeting.

Seven interviews were with individuals involved with digital initiatives in the national libraries; two additional interviews were with individuals who were included in the group through an organic process of referral. This accounts for the inclusion of multiple individuals from two sites (BL and NLS). Four of the participants were female; three were male. (The two additional interviewees were male.) Most of them were age 30–50 years, and minorities were not represented in this group. Two of the participants had advanced degrees, and all but one had formal training in librarianship. At the time of the interviews, two of them were in top administrative positions in their institutions. They had comparable proximity to digital library development in terms of involvement through policy-related activities, such as administrative roles through which they needed to determine the course for the development of institutional digital initiatives or digital project management. The participants' roles—dealing primarily with policy making (P1, P3, P4), with policy combined with project management (P2, P6, P9), or primarily with project management (P5, P7, P8)—influenced how these individuals perceive and describe development.

Semistructured interviews were organized around fourteen open-ended questions. The questions touched on a variety of themes, including the participants' career narratives and involvement with digital library development, revealing cultural identities through which these individuals interpreted their organizational roles and professional identities. The questions prompted them to reflect on development policies and experiences with special projects; to trace the history of digital initiatives; and to identify how localization strategies and elements from the broader environment

4. Even when there were multiple individuals from one site, they were interviewed separately.

TABLE 2
PARTICIPANT ROLES AND INVOLVEMENT WITH THE DIGITAL LIBRARY PROGRAM (N = 9)

Participant Code and Job Description	Background Employment and Training	Years Involved with DLP at the National Library	Activity-Related Role	Domain-Related Role	Knowledge Life Cycle-Related Role
P1, NLP deputy director	Librarian; at NLP 1978–2002 (in present position since 1992)	7 (since 1996–97)	NA	Other (management)	Policy
P2, BNF head of Digital Library Department	Physics and chemistry; librarian; electronic publishing company manager; science librarian; evaluation of automation and technologies for the library (since 1984); at BNF 1999–2002	3 (since 1992)	Infrastructure	Content, other (management)	Project management
P3, DB director general	Biologist; librarian; collection development, acquisitions, cataloging; administration; administrator at DB in 1998	3.5	NA	Other (administration)	Policy
P4, NLS head of Rare Books and Manuscripts Division in the Department of Special Collections	Librarian; at NLS 1977–2002; collection development, acquisitions, cataloging, administration, digitization steering group member (in present position since 1998–99)	4–5 (since 1995–96)	NA	Other (administration)	Policy (evaluation)
P5, NLS deputy head of Map Library	Geographer; map librarian (since 1991); at NLS 1994–2002; cataloging, digital developments concerning maps	4–5 (since 1995–96)	Curatorial, educational services	Content, culture	Project management, utilization

		8 (since 1994)	Educational services, core	Content, other (management)	Policy, project management
P6, BL assistant director (DLP)	Librarian; online searcher (industry); at BL 1979–2002; networks, digital storage experimentation, digitization, administration of funding for digital projects, e-strategy organizing team				
P7 (additional interview), BL digital preservation coordinator	Degrees in conservation of cultural materials and computer science; paper conservator and digital preservation since 1996; at BL 2000–2002: evaluation of digital preservation system requirements	1.5	Core, infrastructure	Technology, other (evaluation), content	Project management
P8 (additional interview), SLIC/CDLR technical advisor*	Cataloguer (Scottish Cooperative Cataloguing Program since 1976); database programming since 1980; at CDLR 2000–2002	NA	Infrastructure	Technology, services?	Policy (evaluation)?
P9 (additional interview), SCRAN publishing contractor [†]	English teacher; Scottish Council for Educational Technology (development of all information technology systems and educational materials, 1986–96?); at SCRAN 1996–2002	NA	Core, educational services	Other (management), content	Policy

NOTE.—DLP = digital library program; NLP = Biblioteca nacional de Portugal; BNF = Bibliothèque nationale de France; DB = Die Deutsche Bibliothek; NLS = National Library of Scotland; BL = British Library; NA = not applicable. Several coding schemes are used for the informants' roles. They are based on the existing schemes used in identifying the digital library staff. These categories identify different types of staff in terms of the organizational setting (the library), domains of activity, and knowledge life cycle (for further explanation of the roles, see [1, pp. 407ff. nn. 14–15]).

* The abbreviations are for Scottish Library and Information Council (SLIC; <http://www.slainte.org.uk/Slic/slicindex.htm>) and its project that the participant was working on at that time, the Centre for Digital Library Research (CDLR), University of Strathclyde (<http://cdlr.strath.ac.uk>).

[†] The Scottish Cultural Resource Access Network (SCRAN; <http://www.scran.ac.uk>) was started in 1996.

are shaping innovation, cross-cultural usability of collections, and their feasibility in the national (local) and transnational (global) context and how this process is shaped by the transition from print to digital formats. These cultural frames revealed how they perceived the normative pressures of the profession, organizational processes, and the cultural authority of their home institutions and how they perceived these goals in relation to the national information infrastructure. The interviews lasted from sixty to ninety minutes and were taped. (The interview guide is reproduced in appendix A). The interviewees' responses are aggregated in the "Approach to Analysis" and "Histories of Development" sections. Because of the importance of individual statements and comparison, quotes from the interviews are coded P1–P9.⁵ (Questions 6 and 8–10 were only partially used in the analysis presented here.)

Approach to Analysis

Theories of cultural production and institutionalization, organizational isomorphism, and the impact of national culture on organizational strategy formulation (discussed in Part I) informed the design of the study and the analysis. The research objectives connected to analytical frameworks are presented in table 1 and the national culture orientation framework in table 3.

The cultural analysis considers the culture dimension to be an outcome of multiple and interacting systems of meaning, including national, organizational, and professional culture and the heterogeneous influences from the "cultural tool kit" (such as popular culture forms or internal protocols of innovating teams), resulting in the following culture formula:

Culture = National Culture + Organizational Culture + Professional Culture + Heterogeneous Tool Kit Culture.

5. The decision to include the additional interviews is tied to the recruitment of study participants, by use of snowball sampling, at the IFLA meeting held in Glasgow (2002). My attempts to limit the interviews to relevant NLS staff were met with skepticism and concern that national digital initiatives in Scotland told from the institutional point of view of the national library would be incomplete. An obligation to privilege the native point of view and the importance placed on the collaborative process led me to use all four interviews in the analysis, although the NLS case is built around the perspectives of the participants from the national library. The data from the two additional interviews were used to contextualize the activities at the NLS within a broader context of the professional culture and national information policy in Scotland. Interviewees P8 and P9 were integral to national digital library development in the case of Scotland, although they were not affiliated with the NLS. They were both male and were trained as librarians.

TABLE 3
NATIONAL CULTURE ORIENTATION WITH ASSOCIATED ATTITUDES AND BEHAVIORS

Variable	Binary Value	Matching Attitudes and Behaviors
External adaptation:*		
Uncertainty and ambiguity	Reduction/ tolerance	Polyocular vision for interpreting ambiguous information vs. generalized knowledge (adapts better to uncertainty and ambiguity) Matching the requisite variety of the situation vs. reducing it
Control	High/low	Frontier spirit vs. fatalism Domination of vs. submission to the laws of nature
Activity	Proactive/reactive	Doing vs. being What one achieves vs. who one is Environment perceived as analyzable and controllable vs. uncontrollable
Truth and reality	Inductive/ deductive	Focus on empirical evidence, hard facts, and tangibility vs. philosophical approaches and theoretical logic
Time	Past/present/ future	Attitude to tradition as positive or neutral Perception of time as linear vs. cyclic Time seen as limited vs. unending
Change	Positive/disruptive	Change seen as progressive vs. disruptive
Internal integration:†		
Emphasis on hierarchy	High/low	
Peer relationships	Individual/group	
Orientation	Task/social	

* Relationship with the environment defined as controlling vs. adapting. Matched to Hofstede's cultural indices: uncertainty avoidance (UAL; propensity for change), individualism vs. collectivism (IDV; relationship to tradition), and long-term orientation (LTO; temporality).

† Relationships define who is involved in processing strategy formulation and the structuring of relationships through hierarchy, peer relationships, and social vs. task orientation. Matched to Hofstede's cultural indices: power distance index (PDI; dependencies) and masculinity vs. femininity (MAS; career success vs. quality of life).

Cultures of innovation will be motivated by interacting cultural systems and nonnational subcultures: the cultural analysis takes into account that compound and heterogeneous nature of culture. The formula of cultural variability for the discourses of development is compounded from the national (NC), the organizational (OC), and the professional (PC) cultures and elements of a heterogeneous cultural tool kit (TC), and they will vary. Where CD is the cultural dimension for each of the five national libraries:

$$CD_{1-5}(NC_{1-5} + OC_{1-5} + PC_{1-5} + TC_{1-5}) = CD_1, CD_2, CD_3, CD_4, CD_5.$$

Cultural styles imply frames for reasoning (and existence of constraints on

reasoning) that determine relationships with the environment and the structuring of interactions within an institutional context. The resulting attitudes and behavior can be controlling or adapting, as shown in table 3.

The analysis starts with an analysis of career narratives that reveal the study participants' perceptions of organizational environments and professional culture. They provided an insight into the frames from which they presented the narratives of development—that is, the reasoning constraints for their accounts (referred to here as formalizations).

Career Narratives as Frames for Storytelling and Reasoning Constraints

In order to frame the discourses of development, the participants were asked to present in narrative form their backgrounds, their current roles, and the nature of their involvement with the digital library initiatives in their institutions. Based on these career narratives, typologies of formalization (social constructivist approaches to technology) are identified.

The participants' roles and length of involvement with digital initiatives are summarized in table 2. In response to the questions about their institutional roles and their connections to the digital library project (Q1 and Q2), the participants' discourse revealed how they manage identity concerns (professional and organizational) in the career narratives. The cultural analysis of narratives used a grounded theory approach to identify the cultural frames for each of the participants based on categories of (1) external adaptation (relationship with the environment) and (2) internal integration (relationships among people; see table 3). Their responses made it possible to identify whether their views present an adaptive or controlling approach to external adaptation, and in some instances it allowed insights into their views of the internal integration (organizational structuring).

Introduction.—The “requisite variety of the situation” [4, p. 153] can be reduced through generalized knowledge or submission to symbolic principles (e.g., national culture, institutional mission). Arguments about formalized policies and procedures, specialized (professional) knowledge, or adaptive institutional framework that responds to pressures from the environment are discourses of formalization. For example, the “frontier spirit” (low control) or tendencies of “fatalism” (high control) [4, p. 153] can be recognized in career narratives. Career narratives are individualized biographical accounts. Nevertheless, they are not incidental subjective histories but formal accounts of careers that connect these individuals to digital innovation. The cultural dimensions of career and role-related narratives are summarized in table 4, which also identifies the four types of formalizations that emerged in the analysis.

TABLE 4
 NATIONAL CULTURE ORIENTATION VARIABLES FOR CULTURAL DIMENSIONS OF CAREER NARRATIVES (N = 6)

VARIABLE AND BINARY VALUE	PARTICIPANT CODE					
	P1 (NLP)	P2 (BNF)	P3 (DB)	P4 (NLS)	P5 (NLS)	P6 (BL)
External adaptation: controlling (C)/adapting (A)	C	C	C	A	A	A
Uncertainty: reduction (R)/tolerance (T)	R	R?	R	T	T	T
Control: high (H)/low (L)	H	H	...	L	L	L
Activity: proactive (P)/reactive (R)	P	P	P
Internal integration (relationships):						
Hierarchy: high (H)/low (L)	H	H	L?	L	L	L
Peers: individual (I)/group (G)	G?	I	I	G
Orientation: task (T)/social (S)	S	...	S?	T	T	T
Types of formalization	Environmental	Controlling	Controlling	Strategic matching	Strategic matching	Adaptive

NOTE.—Question marks indicate that cultural dimensions could not be assessed from the participants' narratives. Participants P7–P9 are not included here. The features that were not revealed in the career narratives are indicated by ellipses.

Adaptive formalization (BL).—One of the participants (P6) projected the digitizing program onto the historical time line of his twenty-two-year library career, combining it with the development of information technologies, thus superimposing it on a narrative of technology innovation in the institution, the professional context, and society.

When I joined the library in 1979, I joined because I was, for those days, an experienced online searcher. So I used to work in industry, researching topics for research scientists, even though I'm not a scientist. . . . And when I joined the library, it was to be one of the people who ran those services, online searching services, to help customers. Instead of being the user, I then became mediator, teacher, whatever, through our online support for our online services. . . .

Since 1994 I've been involved in various digital programs at the BL, starting with applications over networks such as, in those early days . . . the Web server, and various experiments with digital storage, with digitization, and networking technologies, making sure, you know, the library's infrastructure was upgraded in light of the new Internet technologies . . . as they happened. (P6)

Overall, an adapting rather than controlling approach emerges from this narrative in which “uncertainty is managed by matching the requisite variety of the situation rather than reducing it” [4, p. 153]. The adaptation, however, is not presented as accidental but is matched by adaptive institutional formalization in response to external pressures for innovation (coercive isomorphism).

So that was the start, and then we moved into other services, catalogues, providing catalogues to users, to libraries, and microfiche catalogues—it's back in the early '80s, then microfiche was all there was. And then, you know, progressively, as newer technologies came in, I just kept up with that. It was part of what we did, it's all sort of self-taught [*laughs*]. And then, in 1990, I started working in the Research and Development Department, which used to fund research, external research in the UK . . . [*describes activities and his involvement*]. And then we moved on in a couple of years to get joint funding from . . . [*mentions funding agency*], and by then, I kind of moved on to networking strategy. And I liked it. So it came out of building up expertise, very specific role with UKOLN . . . [*describes this role*]. So you know, learning about all these new technologies as well and then moving into applying that to what the library should be doing. So that's how I just happened into it. (P6)

The emphasis on a succession of technologies is matched with task-oriented proactive behavior. Technology is seen as an environmental force adapted to institutional goals that coincide with normative pressures—that is, professional practice rather than institutional isomorphism. The “doing” and “becoming” is seen as a key ingredient of that career path, in which the individual emphasizes an open-ended process of learning and the open-ended process in innovation itself: “So there's lots of things that we're

moving into right now. But we're getting there. I think this is the message. We're not quite there yet. I wouldn't hold ourselves up as any model to be followed. We're just, we're learning about it essentially" (P6). Low emphasis on hierarchy, an emphasis on group rather than individual achievement, and an emphasis on task orientation accompany the adaptive approach to strategy formulation of this narrative.

Controlling formalization (BNF, DB).—A different type of formalization is found in how one of the participants (P3) frames the career path narrative, which is a brief statement of appointments presented as a list of job titles and library functions, framing identity in terms of the professional culture of librarianship as well as her institutional roles:⁶ "My involvement with the digital library initiative in my institution is that as director general. I try to decide in a team, in a team of experts from all over the library, but the decisions are somehow, of course, of the directorate. I try to decide on what we are going to do, but of course I inherited a certain policy and I was quite happy with the policy, and so I kept that policy for the time being, which is not long." This narrative reveals that uncertainty avoidance is resolved through reduction in terms of roles and policies. The participant's official title in this narrative indicates high emphasis on individual responsibility associated with a decision-making process, emphasizing the importance of social relationships that are contained within a system in which roles are formalized. This statement does not indicate other aspects of the relationship with the environment.

Another participant (P2) focused on the institutional framework and on her role inside and outside that framework and inside and outside librarianship.

My background is the library. I am [a] librarian and my university studies were in physics and chemistry. So I'm a scientific librarian, which is not so usual, at least in French libraries. I work[ed] in the libraries for eighteen years. I started a private company in electronic publishing. So my background is really the library work and then electronic publication background. Then I came back to the National Library as head of the Digital Library Department. Certainly because of this background—on one side the digital documents, on the other side knowing exactly what is the

6. Another participant (P7) presented her career path entirely in terms of specialized knowledge and institutional affiliation. She describes her entry into digital preservation as accidental: "There were few people who knew anything about it at the time, and so the fact that I was comfortable with computers and had good preservation background was good enough." This career narrative similarly conveys assumptions about truth as fact-based empirical reality that is sufficient for explanation of how she became involved with digital initiatives in general and the BL in particular. The cultural dimensions in this case are those of a professional culture that this participant carefully defines by delineating a succession of interdisciplinary degrees and institutional distinctions.

library work. Before going to this private company, I was working in scientific libraries, but historical libraries, so also with cultural heritage, as librarian of the history of science and medicine. And after that I was in charge of the corporation for university libraries in the Ministry of France, so engaging corporation[s] in automation and technologies for the library. (P2)

The emphasis is on the distinction of being a science librarian and having a dual background in electronic publishing and library work, as a matching explanation for a unique career path. The inside and outside (of the library and in the electronic publishing business) and containment of the innovation process by means of standards, scheduling, and protocols for outsourcing partners are the boundaries emphasized here.

Formalization takes the form of hierarchical organization and institutionalization to articulate the innovation process: creating a job title, creating a department, “integrat[ing] [digitization] more into the normal library organization,” and temporal closure (“we are entering the second generation of digital system, the system for digital collections”; P2). In that model, the environment is controlled through boundaries defined by the institution. Anomalies generated in the innovation process can be controlled through the strategies of formalization through narrative emphasis on temporal (stages of development), institutional (structure), and generalized knowledge (standards).

My position at the National Library is head of the Digital Library Department, which was created when I arrived. Previously, digitization started ten years ago with the new project of the National Library, as a specific mission, you know. Then, creating this department now is try[ing] to integrate more into the normal library organization the digitization. This department is not very large. It includes the digitization and all the, not really processing digitization but organizing it, selecting the collections, defining the standards, having the technical specifications for companies—it’s outsourced, the digitization itself—doing the quality check inside the library and defining the criteria for quality check, putting this library online, organizing the collections online. It’s one thing in the department; the other thing is consolidating all the Internet and intranet of the library, because the communication inside the library is mainly now through the intranet. And also the department is involved in [a] horizontal pilot project inside the library to change things around digital collections, which are already after ten years a little bit more conservative now. So it’s just to continue to innovate around the digital collections. Because if not, it will be very static, not going into the new standards for creating open archives and interconnections. So it’s—we are entering the second generation of digital system, the system for digital collections. (P2)

Environmental formalization (NLP).—Although individual P1 influences strategy formulation in her institution, the policy perspective is presented as adaptation to influences external to the organization.

Well, I acquired this position at the National Library (it was a choice of the director), and I have been [there], as I said, ever since 1992. My involvement with the digital library initiative is ever since its first aims to be a digital library initiative. I think it is probably because of my involvement in international initiatives—I would perhaps mention those that are connected with the Information Society initiatives that come from the European Union, so as a result of that I have been aware of these digital library initiatives. And also, I have a good connection with other initiatives by the way of IFLA. Because I have been active in IFLA ever since 1989, so I could [follow] these first developments that appeared. And lastly, my involvement was also pushed forward because of a G-7 project that came six or seven years ago and which is called the Bibliotheca Universalis. The National Library of Portugal, although not a member of the G-7 group, was invited to participate in this initiative. At the time we were invited we wanted very much to have a digital library, but we didn't have anything at the moment. (P1)

In this case, local development is seen to conform to a broader context defined by international initiatives. Associated dimensions of internal integration (relationship with propensity for group and social orientation) in strategy formulation and a controlled rather than adaptive cultural framework are also noted.

Strategic matching (NLS).—Low control tendencies paired with uncertainty management through building infrastructure a posteriori—that is, after the initial development has been under way—points to a culture that tolerates ambiguity.

I was one of the people very keen to begin the management of the digital resources that we were creating. I'll describe later how we sort of began in a rather haphazard way and reached a point at which a number of people, not at the sort of policy-making level, but people [of] whom I was one, that were actually concerned with it at [a] very basic level and realized that we are actually losing control over what we were scanning, and that files were sitting around on CDs on various people's desks, and we didn't have a system of file names, and so on. I think this is probably fairly normal, that when you start you haven't actually organized all these things. And so what we did was to set something up which was largely sort of [a] bottom-up initiative, and it was called the Digitization Steering Group. And what we did there was we pressed for a digitization research officer to be appointed, somebody who would actually have time to do a thorough literature search and search of what other institutions were doing and actually come up with some recommendations on how we should organize ourselves. (P4)

This participant's role is tightly knit with the efforts to manage and integrate the innovation process into an organizational structure. In relating these events, with a focus on the digitization research officer, it becomes obvious that an ad hoc process is integral and accepted in this culture of development. Through analysis of his own role, he also acknowledges that

ex post facto infrastructural adaptation (which is expected with an innovative process) is a norm.

As I was a member of the digitization steering group, and we essentially had to press with his appointment, and then when his temporary appointment ran out after three months, we had to press for the continuation of it. But then it came to an end and we were left with a hole, a gap. . . .

And the reason why we're doing that [partnering with the digital image delivery consortium Scottish Cultural Resource Access Network, or SCRAN] is partly that when it came to build an application, that we didn't actually have sufficient infrastructure of our own to be able to propose our own delivery system for images. . . . It was obvious since we were going to have a big increase in demand for digitization, what we actually needed [was] to develop more infrastructure fast. And so the case for having a digitization officer became stronger, and at this time . . . [*describes decisions to obtain external funding from the Scottish Executive to become a hybrid library*]. And in fact that was connected with an increase of funding that the library had to do. (P4)

The participant from the same institution (P5) describes such frontier culture as group oriented and collaborative, organized around projects that bring about strategy formulation (organizational isomorphism). This approach is inductive and focuses on best practices. He explains, "And I think that's why it's something that he [his colleague P4] feels it's important, because of that effort in trying to explain something that was a core NLS collection. It's not significant in scale, but it's significant in terms of the end result" (P5).

He relates his own career path (after listing his educational credentials) in terms of growth and learning, emphasizing this aspect of his role in the digitization process in his institution.

It's grown and changed quite a lot over time, but I was involved with the earliest experiments in using digital cameras in the National Library of Scotland, and that took place in 1995–1996. . . .

In both of those projects I've been the main person involved in organizing what the National Library has done. Sometimes that's involved physically scanning items, sometimes it's organizing the materials, organizing the metadata, organizing the images and how they're stored, in terms of the compression of images, which has been a big focus of everything we've done. And most importantly, really, the organization of Web site access to those images. And although for all of those stages there have been other staff who helped me or worked with me, or sometimes done work for me, I've been involved in all aspects really of that. (P5)

He presents his own involvement in terms of being able to fit a number of roles (matching the requisite variety of the situation). The participant emphasized learning and "doing" rather than "being." This characterizes a pioneering individual and the culture of development that exhibits "frontier spirit."

Summary of formalization types.—The cultural dimensions of career and role-related narratives are summarized in table 4, which shows a distribution of controlling and adaptive cultural attitudes. The career narratives reveal assumptions about external adaptation to be controlling strategies for P1–P3 and adaptive strategies for P4–P6. These strategies were interpreted as different types of formalization and assumptions about the environment. The participants present these assumptions as part of their construction of meanings of their own roles in a given innovation context. The assumptions about internal integration (preferences for organization of relationships and organizational cultures—task versus social and individual versus group approach, importance of hierarchical organization) similarly reveal how career narratives may be seen as discourses of culture (OC, PC). These assumptions are not connected to national culture variables but to how these individuals construct their professional and organizational roles. In the next section, the analysis focuses on the key stages of development (the histories of digital library development) as told by the study participants.

Cultures of Digital Library Development

The histories of digital library development are cultural narratives that reflect the philosophies of development in each of the institutions, as seen by the study participants. These histories emerge through a different process of collection than those already identified in Part I, in the section “The Context: Chronologies of Digital Library Development in European National Libraries,” from an archive consisting of technical reports and gray literature, such as compendia of cultural policies and trends for each of the European countries, contemporary surveys of activities, and national library Web sites. Together, these sources resulted in institutional histories of digital library development in a conventional sense.

In contrast, the analysis that follows seeks to identify distinct models of development emerging from the participants’ narratives, interpreted through the dimensions of culture identified in literature. This analysis combines historical and cultural orientation. An important assumption is that participants operate in an environment in which cultural constraints (nation, organization, and profession) determine strategy formulation and the rhetoric in which it is expressed. Understanding the philosophies of development for each of the national libraries is reflected in the narratives that identify the key stages of development, perception of the environment, and strategies used to manage the ambiguity and uncertainty inherent in the innovation process. The analysis focuses on the participants’ statements about transformative processes in order to present a “thick description” [5, pp. 3–30] of the associated models of development. Thin description would imply surface description in the form of reconstruction of the digital library development in terms of objective outcomes for each of the insti-

tutions. Thick description focuses on such outcomes in the context of practices and discourse in a society. For national libraries, the context is determined by the national, organizational, and professional cultures.

Typology: Pyramid and Matrix Organizational Structures

Extrapolating from the cultural dimensions discussed in the theoretical section, organizations may be structured as a pyramid (high hierarchy) or matrix (low hierarchy) organizational structure.

In the pyramid organizational structure, organizations place constraints upon individual achievement (collectivism) and have preference for social over task-related approaches (social orientation). In such contexts, discourse about innovation is more likely to be controlled through organizational culture and national culture universals (OC, NC). The associated cultural work values are predictors represented in the organizational structures of the national libraries of Portugal and France (see values and explanation in Part I). Therefore, these organizational contexts are discussed first.

In the matrix organizational structure, which has high emphasis on individual achievement (individualist) and a preference for task-related and career values (task orientation), the innovating individual is less likely to control the discourse through culture universals (NC). Statements about change and transformation are more likely to be articulated in relation to tasks, with a focus on process rather than outcome-specific statements. Especially when paired with low uncertainty avoidance countries (Scotland, England, Germany), the rhetorical strategies prefer language emphasizing processes and transitions rather than closure. They are focused on action rather than objects.

The primary policy makers (P1, P3, P4) and individuals who have dual function (as policy makers and project managers) (P2, P6, P9) are found in pyramid (NLP, BNF) and matrix (DB, NLS, BL) organizations. As stated before, they will display higher propensity for generalized discourse and are more likely than project managers (P5, P7, P8) to mention in their narratives all levels of culture (NC, OC, PC).

Histories of Development: Key Stages, Formative Events, and Project Landmarks

The national libraries of Portugal and France will be analyzed first because they exhibit traits of pyramid organizational cultures. The cases identified as matrix organizational cultures (DB, NLS, and BL) will follow. Apart from this overall organization, the order in which cases are presented is determined by an analytical strategy in which certain concepts are developed to allow for comparison at a later stage—that is, the order in

which the narratives are woven together is an outcome of the task of interpretation.

Pyramid Organizational Structure

The pyramid organizational cultures are represented by two cases that provide the context for analyzing digital library development in the national libraries of Portugal and France.

The NLP: The memory of Portugal.—The chronology reconstructed from published reports and gray literature (in Part I) established two important dimensions—that the Biblioteca Nacional Digital (National Digital Library) at the NLP originated from consortial activities with European national libraries for sharing national bibliographic data on CD-ROM in 1990 and that the Bibliotheca Universalis, a G-7 initiative for partnership of eleven national libraries, started in 1995. According to a report issued by the NLP (and authored by a participant in this study), the library held 346 electronic documents. In terms of digitized assets, it comprised 127 works in the language (46), literature (33), education (19), book (8), and music (21) “memory” categories and a total of 23,234 digital objects (images) at the official launching of the National Digital Library on February 1, 2002.⁷ Therefore, at the time of the interview, the National Digital Library at the NLP had become sustainable and systematic and available to the public through its portal.

According to the participant from the NLP (P1), the digital library initiative at the NLP dates from 1996–97. This study participant also qualified this formative period as deliberate and intentional “since its first aims to be a digital library initiative.” She recalls:

I think it was 1996 or 1997. . . . We decided to participate [in starting digital initiatives at NLP and, by implication, participate in the movement of building a national digital library], and I believe that it made me grow very much in terms

7. “Biblioteca Nacional (BN), National Library of Portugal, 2001/2002: Annual Report for CENL—Conference of European National Libraries,” http://www.nlib.ee/cenl/docs/annual_reports/portugal01-02.pdf. This report contains also a statement of strategic mission for the National Digital Library (NDL): “The National Digital Library is a project that aims at creating a service of access via Internet to digital and digitized works with relevance to the Portuguese Culture, History, and Science. NDL is a complement to the contents provided on site by the National Library and a long distance service for those that want to access documents without coming to the National Library. It is a work in progress and, at the limit, it will enable access and fair use of the most relevant, valuable and important contents for the Memory of Portugal, fulfilling a double mission of promoting, national [*sic*] and internationally, Portugal’s History and Culture and guarantying [*sic*] a global access to the national collections. NDL is built also in the assumption of a virtual library, i.e., comprising contents that are dispersed over the different National Library collections and also in holdings of other heritage institutions.”

of awareness and be in contact with ongoing initiatives, although some of them were at their beginning. But nevertheless, it was important, because coming up late, it has some advantages as well. You're not going to repeat errors or mistakes that other people have done—and you have a clearer picture about best practices and costs, effectiveness, and long-term maintenance, long-term preservation. So I can define these first initiatives that I came in contact with as very straightforward actions, it's true, but in the majority of cases those were actions that led to [a] huge amount of digital images without a clear picture about what was going to become of those images later on. (P1)

In this narrative, there is recognition that the development of the national digital library program at the NLP followed similar developments elsewhere. The national library is seen as interpreter of trends and facilitator for international cooperation, following the tradition of library cooperation. The NLP is seen in the community of practice (professional culture isomorphism variable) in a global framework.

It is really important for national libraries to be able to work together, because a great part of our heritage contents not only regards our country but it regards some other countries in Europe, so it is important to develop strategies in terms of—if I want to see, for example, the maps about Africa that exist in other libraries, how shall I know that they exist? How can I enter that database? How can I search their digital library? So, participating in this project has also been very good for us to acquire a good methodology and to be able to work together. (P1)

Being able to participate and “work together” in *Bibliotheca Universalis*, a transnational framework for national libraries including the NLP, is the dominant theme in the rhetoric of this beginning; further emphasis is on participation in a G-7 project, membership in the European Library and the European Commission on Preservation and Access, and learning through best practices (as recorded in the documentation of the Council on Library and Information Resources, the Digital Library Federation, and the IFLA and the experiences at the Library of Congress and the National Library of Australia). Interoperability, consolidating contents, and sharing resources is not unique to digital libraries. This approach underlies library practice and the rationale for technology innovation in the library context. This context provides the frame for library development.

Participant P1 presents the beginning as consisting of “straightforward actions” within overall uncertainty as the organization adapted technology to the requirements of existing library practice and its adjustment. “At the beginning,” she says, “it was, ‘digitize, digitize, acquire a lot of images’ and without really knowing how to put them together, how to make them [collections of digital surrogates] resemble to a library. For instance, in terms of possibilities of accessing, and long-term preservation was something that was not in everybody’s mind at the moment.”

A driving force for technology innovation that gave rise to collections of digital objects was a need to contextualize them. The first level of contextualization was in terms of institutionally produced controlling strategy, “to make them resemble to a library.” Another form of articulation is through cultural imperative of tradition; print and paper originals and their digital surrogates are subsumed under the “Memory of Portugal.” Thus, discontinuities of technological change were absorbed within an integrative culture of circulation developed around the idea of national heritage. The following account captures the events from 1996.

And it started [*hesitates*] in 1996. And it started as a pilot experience and not meant for Web access, but just for a pilot CD-ROM with contents that were chosen according to an idea of making a sample of the most prominent Portuguese writers and their most prominent works. So this CD-ROM was somehow the first attempt to build a digital library, although it was in [the form of] a CD. Because for each book that was chosen, there was also information about the author, there was also a bibliography about the work that was digitized. Also, other materials that might be of importance. I mean, when the work has also gone into a process of maybe being filmed, or that you can have it recorded, for instance, by someone who is reading or speaking or something, so we tried to tackle that. So that people could enter this CD-ROM, search for the works or search for the authors, find relevant information about the authors, find relevant information about the work itself. Some translations, especially for English, in case they existed, and the works were all digitized in OCR [optical character recognition]. So that meant that you could use this database even to make comparisons between the use of certain terms by one author and by others that followed him or preceded him, and you could make a lot of things with that. And also because we were digitizing in OCR a modern edition and in image mode a former edition, it looked very nice, because people could, well, at home, print their own version of the sixteenth-century book—it’s not very quality-like but, nevertheless, people like to see this sort of things and they, they feel that they have a piece of their own heritage in their hands. (P1)

The public, being able to “feel that they have a piece of their own heritage in their hands,” can experience the unfamiliar through the familiar—a common form of digital technology (CD-ROM) and the staple of everyday use of print (newspaper). The two media manifestations, the CD-ROM and the newspaper, belong to documentary cultures of digital and print objects.

And we never cease to walk on that path [i.e., contextualizing digital objects in the authentic culture of circulation of the physical object]. We are always taking in[to] consideration the artifact itself. So, I can say that we launched the lines, the first lines of action. So [it] was not just to, you know, digitize a lot of things without any context, but building a context for the works that were being chosen for the digital library. So that people could have a sort of access and not just a lot of images that they could search. This CD-ROM was rather successful, and very popular among

teachers because they could prepare their homework more efficiently. And even in universities it was very much used because of the OCR, because it enhanced a lot of works that people had to produce in terms of linguistics, comparative literature, and things like that. So it was, it was not very, very big. I mean, we had 50 authors and 100 works. . . . It was two CDs, I must say. But it was nice, and it was the building of it, I think, it was good. At the time it was what was available. (P1)

The continuities of cultural circulation absorbed the discontinuities of accelerative technological change (i.e., “digitize a lot of things without any context. . . . So that people could have a sort of access and not just a lot of images that they could search”) and prepared a model for subsequent digital development in which access is constructed through context for digital objects to present a narrative of culture, rather than seeing digital library development as a problem of technological access.

Nowadays things have been progressing so well, . . . we are digitizing with greater quality than at that time. But, nevertheless, I must say that it was a very rewarding experience also because it made us work together. I mean us: me as coordinating librarian, and other librarians, it made us work with scholars. We invited one to be the sort of person, so to say, the person who would be in charge of coordinating, and he chose the person that was specialized in this author, or in this period, or so on, so there was a lot of people working. And for them it was also a very rewarding experience because the majority of them have never been in touch—it was, this was 1996 or 1997. They had never been in touch with CD-ROMs. And I remember that the first presentation that we made of the CD was made for the staff, the people who had put [in] some work—either writing biographies or choosing images to illustrate things—and I can say that they were absolutely marveled with the potentialities that these kinds of things have. Of course this [CD] was portable, and it was distributed with a large newspaper in Portugal. Every Sunday they distributed a book, or something like that. So it was distributed on a Sunday. Two Sundays, I must say. So people bought their newspaper, and with a little more money they bought the CD as well. (P1)

Using a major national newspaper for public support for a digital initiative (to distribute 10,000 CD-ROMs) is a unique strategy that recognized the economies of scale inherent in old technologies; it also incorporated a new medium into an earlier media ecology and print culture. The innovators recognized the ability of an existing framework for the circulation of culture to serve as conduit for the introduction of innovation. They also recognized the potential that technology can confer to the ability of media for recirculating culture: “they were absolutely marveled with the potentialities that these kinds of things have” (P1). A focus on public acceptance was a necessary ingredient of the heritage-building process because heritage cultures depend on having legitimacy [6]. The need to reduce uncertainty brought about by the imperative to innovate was accomplished through focus on media continuity and on heritage and tradition. It ap-

pears that in this culture of development the strategies of incorporation of technological change are through institutional (“to make [collections of digital surrogates] resemble to a library”; P1) and cultural articulation (heritage as a generalized view of culture).

Greg Urban introduced the notion of the cultural imperative to explain the circulation of culture in modernity: “The gradual change over time of cultural objects, as they undergo replication, can be kept in check and coordinated by the application of accelerative force through imperatives” [7, p. 152]. The imperatives govern the future in terms of the past, and they enable the emergence of new cultural objects.⁸ The national library has the cultural authority to generate imperatives, such as propelling innovation in the area of digital libraries. However, in order to reconcile divergent strands of culture that arise from emerging forms of culture (e.g., digital media), as in the example of NLP, the technological imperative is folded within an existing cultural imperative of cultural transmission that continues an institutional mission for the national library. Imperatives for technology innovation imply transmission of heritage and continuity of media environments. In this case, the Memory of Portugal is a cultural object, form, and imperative accelerating the adoption of digital technology. The Memory of Portugal is the next key development in the development of the National Digital Library at the NLP and an official program around which digital library innovation is articulated in that context.

As for the digital library itself: well, we began, as I said, participating in this forum [that resulted in issuing a CD-ROM] and trying to develop some guidelines and strategies. What are we going to do? What kind of digital library would we like to construct? And we decided after some hesitation, some coming forward and coming backward, because things are like that, we decided to go into a project more closely with other national libraries, and more focused on the Memory of Portugal [MP]. So, the MP is very large and it is very huge. . . .

Yes, the official name is National Digital Library. That’s what it is called, but a great part of it is constructed under this scope of the MP. And the MP for the moment has several subsections, so to say. There’s the Memory of the Book, there’s the Memory of Science, the Memory of Literature, Memory of Language. If you

8. The imperatives are about culture, and they are socially transmitted; they are “conduits for the transmission of culture” [7, p. 147]. Urban calls us to imagine imperatives capable of creating “radically new cultural objects, never before experienced,” such as the “Pharaonic order to produce the first Egyptian pyramid some 4,700 years ago” or “President Franklin Roosevelt’s 1939 order authorizing an attempt to develop an atom bomb, which led, eventually, to detonation of the first nuclear weapon in Alamogordo, New Mexico, on July 16, 1945” [7, p. 148]. Although the ideas (about pyramids in Egypt and nuclear weapons in the United States) were present earlier, the “pharaonic and presidential orders undoubtedly initiated or unleashed the social activities that led to the construction of the first pyramids and building of the first atom bomb. The result in each case is that something new appeared in the world” [7, p. 148].

go to our site, although it is in Portuguese, you can have a fair view of all these sections of memory that we are trying to tackle. (P1)

The “heritage imperative” allows for control of content and participation of institutions and society. It is an imperative in the service of tradition [7, p. 149].

And we try to keep the name [Memory of Portugal] because this way people will recognize it more easily. So, for example, for the Memory of Science—but this is true for the other memories—we choose a person from the scholarly world which will be representative for the task of choosing the contents, the more relevant contents. That person will go and see the contents that exist at the National Library, but not only at the National Library, at the National Archives, at other libraries in Portugal, and if possible they can direct us to contents that exists in other libraries in other parts of the world. (P1)

As cultural imperative, the Memory of Portugal is teleological—because it provides an overarching structure for development and consideration of the new in terms of the old. “Well, this part, the memories we began working [on] . . . say about one year ago. But not all the memories are available yet,” participant P1 says. “And it is a work in progress, so it means that you can find already many things in one memory and very few things in another. It is a work in progress. It’s not done.” The public launching of the National Digital Library (the Memory of Portugal) on February 1, 2002, attracted significant grassroots participation.

We had been having offers from people that write about certain topics that they find in the digital library, and they say, “Well, I have this text and I’d like you to have it and put it on the Web if you want it because it is about this author or it is about this work,” or so on and so forth. And so I think that is also very good. I mean we also have a little bit of inviting people to send us comments or send us texts that they would like to be published on the Web. (P1)

The launching of a CD-ROM in 1997 forged an initial link between a new document form—the literary canon—and the public. In the period from 1998 to 2002, the launching of the Memory of Portugal brought distinct and chaotic developments (thematic sites) under a common concept.

Between the CD-ROM that we launched in 1997 and 2002 when the digital library started, as I said, we discontinued the CD-ROMs and we started creating contents on the Web. And those content[s] were thematic sites. So, between 1998 and 2002 we have built several thematic sites in our Web site regarding different aspects of Portuguese history or literature because it was events or commemorations or things like that. So, for instance, when [we] had this twenty-fifth anniversary of our revolution of 1975, we created a site on that revolution with ephemeral contents, not the ones that everybody had seen, but the ones that had been distributed in the

streets and that were meant to, you know, just to put on your [lapel?] or something like that, posters, and things like that. So we grabbed what we could and we launched a campaign, a national campaign for people that had those things at home to lend us so that we could digitize them. Because it was—those were ephemeral, you know. (P1)

In this description of the campaign, the cultural imperative was reinforced by means of commemorative events, another way of weaving the old and the new cultural forms. The national library presents its cultural authority in the new medium through reorganization of its existing collections around the themes and the Memory of Portugal and thematic sites as intermediary structures. “The Memory is a virtual library around a very huge topic like Portuguese science or Portuguese literature,” participant P1 says. “The thematic sites, it is about one writer; it is about one event.” The centenaries were foci for launching the digital innovation.

Those were not things to get into posterity, so even newspapers that were launched at the time and now are finished, and so we have then this kind of sites. Also for writers, whose centenary were passing at the moment in 1999, in 2000, and 2001, we created several of these sites. And we also decided to put on the Web some of our major exhibitions, to create the exhibitional site and have a virtual exhibition on the Web. So after these experiences, we decided we had already grabbed experience enough to go into the digital, into the national digital library project itself. (P1)

The systematic digitization at the NLP in the technology unit of the Department of Innovation and Development indicates a significant level of institutionalization and integration within an existing organizational culture at the time of the interviews. What was an experimental phase of building thematic sites becomes “pure librarianship and technological work” at the point of institutionalization.

It is not the same thing as building a thematic site in which you have some pictures, somebody putting in the biography of the writer, nice pictures, creating the links to, you know, just the title page of one of his works or something like that. It is not the same thing at all. This is pure librarianship and technological work; it takes time and it is expensive indeed. But it is very challenging, I must say. It is indeed very challenging. And you start with one idea and you have to readjust in the course of the events. You have to be constantly readjusting. (P1)

A department that was formed in 1997 with a staff of three—“to have an accompanying department for this CD-ROM that I mentioned before” (P1)—quadrupled in size by 2002. There was a comparable shift in the organizational culture and recognition of the value of digitization as a reprographic process, as shown in figure 1. The *discours* of digital library development in this diagrammatic representation highlights the shift from

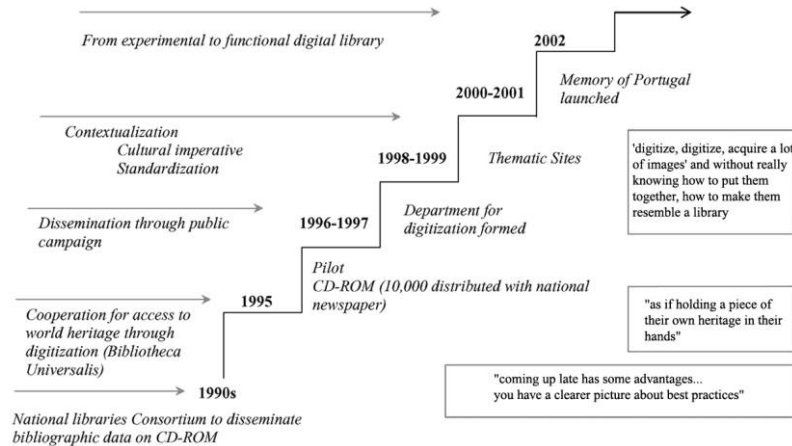


FIG. 1.—Digital library development time line for the Biblioteca nacional de Portugal

the experimental to the functional digital library and the unique institutional memory from which it derives its significance, according to participant P1's narrative.

Overall, the model of development explored in the case of NLP shows a culture of innovation that controls innovation through a cultural imperative that ensures continuity of national culture across print and digital document environments. Public campaigns were integral to the development process, as legitimacy mechanisms for these digital heritage collections. The Memory of Portugal is a hierarchical knowledge structure that presents a cultural schema established through literary and knowledge canons. This is a form of uncertainty avoidance that validates continuity and tradition, thus emphasizing values of the collective nature. Maintaining equilibrium through cultural incorporation is a running theme. As participant P1 herself said at one point: "Yes, look, digital library is not very different from what we are used [to]." In this description, the model revealed is the centrality of tradition as the cultural imperative for digital library development.

The BNF: The encyclopedic library.—The launching of the Gallica experimental server in 1997, succeeded by Gallica 2000, organizes digital library beginnings at the BNF in published sources and gray literature (presented in Part I) around the history of technological artifacts. Thus, technology imposes a surface periodization for which the interview provides thick description, presented next.

The interviewee from the BNF (P2) describes the beginning in terms

of institutional processes and policies (organizational culture), as well as the broader media environment, in a narrative that focused on the digital library development through a temporal frame—from its beginnings in 1988 to the start of production in 1992, from “an idea of digitization” in 1988 to “digitization itself” in 1992.

The idea of digitization came with the new library project in 1988. It was already in the project, you know. So the library had two years studying what can be done, defining the policy and deciding the standards, the quality level and everything, and the digitization itself started in 1992. Which is quite early [in] the library history of digitization. . . .

We had the first phase, which was during the creation of the new part of the library, the new building, and some new organization. The first digitization ran from 1992 to 1998. (P2)

The first phase of development from 1992 to 1998 was also a period of institutionalization, efforts to “create a library” (P2), and of the systematic shaping of the collection. The online public access to the collections came in 1997.

The network was there since the beginning, but it was not Internet. So it was intended to be the local area network of the new library, which was at this time thought as a technological advance, you know, with a lot of work stations for the users and also possibly other libraries, but restricted network, a small one, with some other main libraries in France, as the new library was seen as head of a network. But it was not the Internet. The first collections online—the first sample of collections online, on the Internet—started in October 1997. (P2)

The institutional/cultural goal of building an “online library of the French culture,” combines the cultural imperative of French national culture with a strategic choice model for the shaping of technology, viewing technology as an intentional product of design and appropriation [8]. From the onset, the framework for a comprehensive encyclopedic approach to French scientific and cultural heritage was determined as a systematic (normative) outline of knowledge by setting an ambitious goal with scholars as the “target initial audience” (P2). In this approach, the “extensible kernel” (P2) would allow for a synoptic arrangement of knowledge through Gallica to encompass mushrooming themes, as described here:

So, this stage was first policy for . . . books. Then during the first stage started also images, still images. . . . During this first stage we had two policies: one for the [printed] material, which was to create a library, an online library of the French culture, let’s say. So selecting the main authors for all the period[s] of time, the main authors writing in French in all the subject area[s]. So it’s an encyclopedic library of the French culture. After selecting those authors, listing their works, listing their scientific institutions in which they were involved, listing the journals where they were writing, and listing the other authors with which they were in

connection when working. And it was entered since the beginning in the database for proposing authors relating to others, and covering all the period[s] of time and all of the subject areas with history of writing. Not necessarily literature but also science, philosophy, politics, and so on. (P2)

The difficulties involved in creating a seamless comprehensive library built around intellectual properties rather than materiality of documents and restrictions on access called for a policy to regulate the seamless collection with an encyclopedic scope.

In the period between 1995 and 1998, the expansive aspects included bringing new partnerships and extending the scope of digitization to a broader range of document formats.

The original project for books for this first phase was 300,000 books or volumes because there is also journals inside, but it was reduced because selecting, deciding about copyright, deciding about the original physical status—if it's direct digitization or if it's [the] first print of the document itself—is taking much more [than] one expected at the beginning. So the library did only a third part of the expected program for the printed collections. Then by 1995 it was decided to add to this first policy the still images with iconographic documents, which can be photographs or historical photographs, prints. . . . Then it was decided to have a large collaboration with other institutions in Paris, other cultural institutions of the Ministry of Culture in different libraries, photographic agencies, and so on. (P2)

With the recognition of rights attached to documents, the social and technical aspects of digitization needed to be negotiated through articulation of policies (management of intellectual property rights for digital reproduction) and digital asset management.

Here, the library digitized 250,000 images, which were gathered in folders. And some folders could have 200 images inside and sometimes only one. Taking the main photographers and so on, you know just selecting on the collection basis . . . or the artist basis . . . selecting things in different areas, not necessarily in public domain; it is the same for the printed material. At the origin, it was just the beginning, you know. The library came to the publisher saying, "We plan to digitize, it will be given on-site and to some contractors but we can know who they are and so on." And they did not believe at the beginning it will happen? So they said, "Well, okay, digitize and we will discuss." And then we had to start discussion. So, from this first phase, only half of the printed documents are in the public domain and can be offered on the Internet. The rest is partially offered on-site at the moment because we succeeded to negotiate with the right owners. And the rest, and some are still pending, and when I say some, it's about 20,000 volumes pending. So every year now, a part of this collection is going to public domain and we include it in the open collections. But, it's difficult, you know. . . .

Yes, it is one of the lessons because it's so much time consuming, trying to solve things and to make specific contracts for all the documents, you know, with the right owners, that we decided to discontinue this and [we are] waiting for a more,

a better situation in general and not trying to fight alone against this and to fight with the publishers. (P2)

In the transitional period from 1995 to 1998, a self-imposed limitation to the universal encyclopedic approach to French cultural and scientific knowledge (through development of themes) was the copyright wall. The model succeeding the comprehensive encyclopedic library was the model of the selective thematic-encyclopedic library. This is the period known as cornerstone closure in the SCOT theoretical framework, when a technological artifact is redefined [1, 2].

Since the launching of the digitization process took place in parallel with the move to the new library building, the idea of the online library of French culture conceptualized as an equivalent of the comprehensive physical library may have seemed viable. This ideal of a seamless encyclopedic library is transformed into its project-based manifestation.

It was [the] initial phase, you know, for the library, for the new library. So it was specifically funded and it was not working on a year, fiscal-year basis. It was a certain amount of money . . . to be spent over several years as the original creation of the new library. Then, after that, the library entered in a process of fiscal-year basis for receiving a paycheck and spending it, including digitization. So it was decided this time to have a three-year-basis plan that can be reviewed of course . . . but deciding for three years digitization with several policies. And it was decided at this moment to have . . . a multimedia approach on themes. So selecting themes, then taking for each of them printed documents and images and sound if you can, and why not also video. But you know, it is easier to cope with the copyright with printed material, less easy with images, and quite impossible with sound and video. So, well, to take many sorts of materials on the theme and only in the public domain. So then the library decided to stop to digitize things which are not [in the public domain]. (P2)

The shift from a comprehensive model (universal library) to selective thematic collections in the development of the Gallica digital library (the project stage) occurred from 1999 to 2002. It consisted of two three-year phases, which corresponded to financing cycles of competitively selected projects. “So we had a phase from 1999 or 2001, and now another 2001 to 2003, which is again with the thematic approach plus,” says participant P2. “So we, the first [three]-years program was to continue to extend the kernel of the collection created in the same way, so complement it, add [to] it documents with the same selection policy. Plus having some themes like the travels” (P2).

The extensible kernel resulted in limited-scope projects within a generalized framework of an encyclopedic digital library. Examples of systematic continuation of the kernel as a generative principle for Gallica encompass “dictionaries and encyclopedias—reference documents” (P2), a

systematic program of digitization of forty to fifty titles of national newspapers of the nineteenth century, starting from the first issue to the copyright wall of 1900. The fleshing out of the kernel by linking collections across institutional repositories aimed to build a seamless library that establishes continuities in completeness and comprehensiveness of collections and format types.

In describing the “project stage” of development, participant P2 listed several commonly found approaches: the travel projects “popular everywhere in the digitization,” with “the first one [being] travel in France” and “the second one travel in Africa,” and Web exhibitions coordinated with physical ones in the library. Marcel Proust and Utopia (in partnership with the New York Public Library) were virtual exhibitions complemented by the display of artifacts. These Web exhibitions were seen as an extension of displays, providing a more complete and more coherent experience of viewing: “For instance, in the exhibition we had small places with books displayed, you know. Just like a small private library but there was only one page, or no more than one page really displayed. But going to the virtual exhibition on the Web site, you could open this book and you can click, you could click and still can click on the book, go to Gallica, and then open the book and read it, you know. So it was really complementing but it . . . it was about 400 titles, you know” (P2).

One of the collaborative projects in an initial project was the consolidation of small journals of learned societies dispersed in provincial libraries and the BNF (600,000 pages). Such an archival (comprehensive) approach in digitization is comparable to the earlier technology of reprographic reproduction that resulted in the creation of powerful research tools that are now being digitized.

In the second project stage (2001–3), the preservation approach became a dominant one, focusing on rare materials and topical collections and leading to international collaborative projects.

And this preservation perspective is just going more with the collection approach to the specific special collections of the special collection departments: manuscripts, maps, photographs, prints, and so on. . . . And here we are now digitizing a collection. For instance, the collection of an architect’s on the drawings of an architect. And we have the whole collection. We have two cases where it’s on all the collection, which is split between different libraries. . . . So we are running a program on Chinese manuscripts funded by the Mellon Foundation with the British Library, with Beijing, some libraries in North America. It is the Dunhuang project. (P2)

Strategic international projects aimed to reunite materials that had been separated by the history of the creation of the artifacts, archiving practices, and institutional histories.

Content selection and technology are seen as two distinct functions re-

lated to digitization. At that time, digitization was not yet reduced to routine operation or integrated in the organizational work flow as a technical process. As noted by the interviewee, “[Digitization] is not normal. Once the library will consider digitization as a normal technical process” (P2). Digitization is seen as a technical process on the way to becoming a routine reprographic technique.

And well, what I do think, in fact, is that the technical aspect is now more and more close to the Reprographic Department goal, you know. And the Reprographic Department, which is in the Conservation Department, it’s part of the conservation. This sector is now more and more, first digitizing rather than taking pictures, analog pictures. So at least in that, within two or three years, maybe we will be at the stage where the content will be decided as collections and the technical process will be a single one inside the library as reproduction, as part of reprographic. (P2)

Multiple problem-solving methods were required still in 2002, and that meant that content and technology issues had to be considered together. The establishment of the Digital Library Department in 1999 was a landmark in the institutionalization of digital projects,⁹ which had already started in 1992 with the establishment of the Digital Development Team as “a specific team created as heading this mission but not having the same status in the organization as a regular part of the library” (P2), a progression visualized in figure 2. The temporal construction of digital library development is presented as a diagram delineating the vernacular periodization based on this interview, from the launching point and the idea of digitization (presented as externally directed with the move to the new building) to the as yet vaguely articulated (and externally directed by means of Gallica 2000) second project phase.

In this model of development, problem solving is delegated to specific parts of the organization. The establishment of the Digital Development Team (1992) and the Digital Library Department (1999) were means of reducing organizational uncertainty resulting from technological innovation. The ability to undertake and pursue the completion of large-scale projects without disturbing organizational routines is an advantage of such an approach. This strategy is controlling rather than adaptive. The diffusion of innovation inside and outside the organization is managed through the Digital Library Department.

Digitization projects such as . . . [this], . . . like nutshells, [are] arising everywhere. So when somebody inside the library or outside a library thinks that there can be

9. The role of the Digital Library Department is to manage the process for all digital projects. While some digitization is accomplished in this department, its primary role is to establish priorities and coordinate work of a cross-departmental selection committee, thus adding a bureaucratic filter to competitive selection of viable digitization projects.

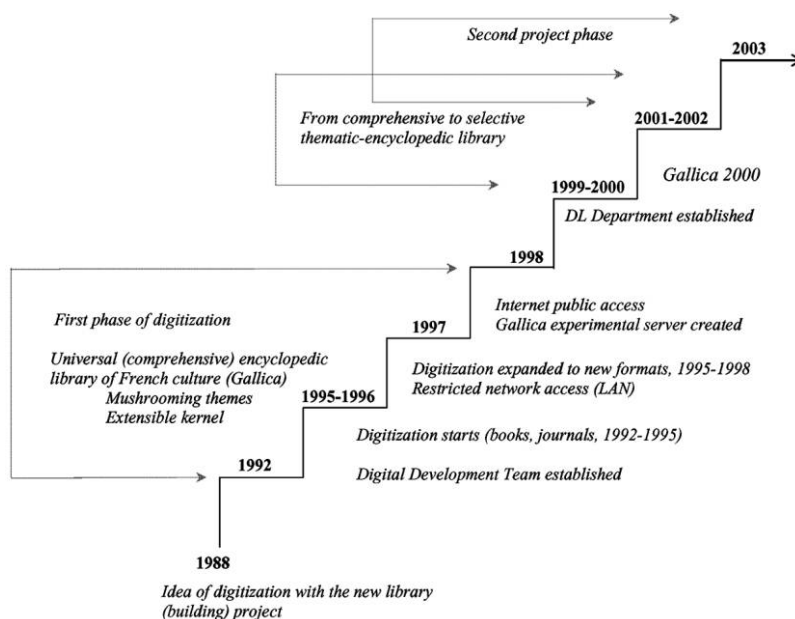


FIG. 2.—Digital library development time line for the Bibliothèque nationale de France

a project in cooperation, we just have a form for describing the project, [and] we ask people to fill [out the form], describing the purpose, the size of the collection, the copyright status of the documents, the different types of material included in the project. . . . Technically, it's always the service inside the Digital Library Department, which is a technical project leader, but for the content it can be, and also department of collection inside the library, or it can be another library. (P2)

This bureaucratic filter assures efficiency and coordination of effort within a centralized schema, thereby centralizing the diffusion of innovation. Developing best practices through collaborative projects are integral to the educational role of the National Library. Participant P2 says, "Well, you know, the National Library is always thinking, 'She [*sic*] is doing it [right],' and the other[s], 'The National Library is nuts' [*laughs*]. It's the same everywhere. But, well, we really do work with other partners." In this instance, the BNF clearly carries cultural legitimacy as the epicenter of digital initiatives of the society, as it ensures broad diffusion of technological innovation, and the synoptic arrangement of knowledge through Gallica encompasses mushrooming themes of participant projects and provides coherence and consistency to the digital library as a knowledge structure.

At the beginning, you know, people—collection people—saw digitization as something crazy. . . . And now they all want to do something with digitization, so it is

not really a collection development policy, it's rather allowing everybody to have an opportunity to start with the digitization process and to allow them to have a chance to do it, you know, at first. So, it's trying together since we jumped. Well, sometimes the library in general, when you have the committee say, "Well, we cannot have all those different things which are not relating to each other." And we decide to cancel something. . . . So, it's not a real policy. The only policy is the kernel, which is continuing to enlarge with always the same, the same policy, let's say having a digital library of reproduction of printed documents and possibly manuscripts associated, or images relating to a reading room, having the classification areas where you put, you know, the main, the most important documents there. . . . And we always try to attach new ideas, people['s] ideas to something, in order to organize the result because, if not, you just have a list of completely different things. So, it's the approach we prefer, just to select the contents . . . as consistent content [as] we can get. . . . But also . . . digitization is everywhere now in the library, the minds of the different people inside the library. (P2)

Although the final outcome is structured, innovation is not systematic but chaotic, as recognized by this participant. Ensuring consistency in the process of digitization is an overarching concern in this case. Discourse around digitization is also a discourse about the access/preservation dichotomy and the status of the collections, as well as a new form of interaction with knowledge artifacts (the shell and the content are seen as discrete and separate).

If you look at the traditional policy for what production is for preservation and access, the policy was there to decide on the basis of the physical status of damage[d] documents to decide to have a reproduction. It was one thing; the other was just to take opportunity . . . [i.e., to] request of users to keep one copy, one reproduction copy, and to retain it as a master for further reproductions. And now, we have also digitization there, replacing the analog reproduction, you know. So here, we have other repositories, which are now growing, which are not on the same collection development policy, which is by the preservation, and by use and by request of reproduction[s]. So it's another thing, but it's there, and we have also to put them and archive for long-term retention. (P2)

At the point of the interview, the limited technical capacity of the storage system designed for internal use was an impetus "to prepare the next generation of the system to be sure . . . [because] one day . . . [this one] can well just collapse" (P2). This technical problem is matched by semantic ones, as digital repositories are seen as independent of the physical information objects of the traditional library and of preservation/access concerns that were the rationale for digitization in the first place. The digital library is seen as a unique new form of structured knowledge, a new form of library.

One of the significant loci of control for the discourse of digital library development is national culture. Gallica and the "kernel" collections of its

encyclopedic approach provided a unified schema for an online library of French culture, which provided opportunities to develop strategies for experimentation into content-technology solutions.

Matrix Organizational Structure

In the matrix type of organization, statements about change and transformation would likely be articulated in relation to tasks, focusing on process rather than outcome-specific statements. They would be action rather than object focused, focusing on processes and transitions rather than closure, especially when paired with low uncertainty avoidance countries (Germany, Scotland, England). The following sections present three models of digital library development in matrix-type organizations represented by the DB, the NLS, and the BL.

DB: "The Virtual German Library".—The German Digital Libraries Project, launched with initial funding in 1998, was to be completed by 2004 in two phases. Its focus was on electronic resources and access and the development of prototypes for a German national information infrastructure. Summed up in the chronology (in Part I), the beginnings of the national digital library at the DB are further elaborated in this description in which the political realities of the federal state emerge as the primary cultural framework for the national library. Culture is seen as decentralized; the national library exists primarily through its coordinative functions.

The situation in Germany is that we are a federal state, *very much* federal. That means that the culture—and universities belong to culture, science belongs to culture in Germany. Culture is with the Länder [states]—so not with the federal state, but with all the sixteen states in Germany. So there might be different policy in all these states. And I know of several states that have excellent policy for digitizing things. And there might be also the really important libraries for the historic materials. For instance, the Bavarian State Library is just wonderful, or Wolfenbüttel or Berlin or Göttingen. So they are all in separate Länder, as we call them, and there are special projects and policies and projects and programs for digitizing materials. Whereas we are a federal institution and we are one of the two federal libraries, so there is not really a program. We have to apply for single projects if we want that. And the problem again is with our short history. So [a] state or a policy would tend to do something about the wonderful, beautiful things that really belong to the past, to the very old thing. So we are not the first address for digitizing material because we are relatively young. (P3)

The DB had a relatively short institutional career as compared with other national libraries studied in this article. It was founded in 1912 in Leipzig as Die Deutsche Bücherei, with a mandate "to collect, catalogue bibliographically and make available for use free of charge German and foreign-language literature published in Germany and German-language literature

published abroad.”¹⁰ Other national libraries (e.g., the BNF) have grown into major cultural institutions of their nations as a product of cultural nationalism and have historically served as mechanisms of the “centralization of literary and historical tradition, the patterns for obtaining access to knowledge and distribution of research instruments” [9]. As compared to them, the DB had a relatively short history in that sense. The cultural identity for the national library is tied to its collections (built through legal deposit starting in 1913). The place of the national library in the context of intellectual property regulations and the competing interests of rights holders emerged as a central issue of digital library development in this institution. Participant P3 says, “So when you look at this relatively short period of time for a national library, I mean, just compared to the British Library or whatever, it is always the theme of copyright, because we don’t have so much older collections that are free. It is always a question whether we should really go into digitizing things where you have to negotiate with publishers, with rights holders, etc.” In addition to the practical problem of being limited to materials that are in the public domain, this identity may be the reason why digital library development is primarily focused on “born-digital” resources, which was a primary concern at the time of the interview.

So we hope that in maybe two years’ time we get a new law giving us the right to collect everything that is born digital in a networked environment. Up to then, we worked very hard for, now let’s say, five years or six years, to get all these materials on a voluntary basis. And this was one of our major issues during this time, to get publishers [to] agree on a voluntary deposit, to get universities, researchers, etc., to agree on voluntary deposits. This means a lot of public relations work, etc.—to get to those people, to get them [to] agree on all this. . . . So this is our main issue. But we saw of course that many other libraries do wonderful things with digitizing material, so we try to find something that is, let’s say, unique in our institution, that is looked for by researchers and that is maybe even hard to use, etc. So we did some digitizing on Exile Press journals. (P3)

The decentralized national library concept is a legislative shell for cultural texts, state policies, and recirculation of “the wonderful, beautiful things that really belong to the past, to the very old thing” (P3) in the form of digital collections.

And there is a working group that was set up several years ago where we tried to make up [for] the drawbacks that come up with this decentralized national library concept. We found libraries that [were] very strong in their collection for a certain period of time starting from Gutenberg’s invention up to now. And from 1913

10. Deutsche Nationalbibliothek, “About the German National Library,” http://www.ddb.de/eng/wir/ueber_dnb/geschichte.htm.

onwards, it is our task. But before that, there is Wolfenbüttel, there is Göttingen, there is Munich, Berlin, etc. So there is a group of libraries that act as national library for that period of time; they try to buy material for that period and they try of course to digitize materials. So this is a cooperative approach where it is always very clear who is responsible for what because we did this splitting in periods. (P3)

The generalized idea of the national library provides a framework for cooperation and the aggregation of resources and standards for organizing heritage virtually. The network is a mode of reconstitution, a technological artifact that overrides discontinuities of history by generating a seamless web of generalized German culture. The idea of German culture is presented as a pragmatic concern for which a networked collection is a pragmatic solution: “We couldn’t change the history so we try to put them all together in a virtual library context” (P3).

The importance of the integration of infrastructure is dominant in this model of development, and so is the emphasis on fiscal planning, development of standards, collection development policy, and solutions to long-term preservation—that is, concerns for effective diffusion of innovation within a broader institutional network and not only the immediate organizational context at hand. “So the key stages is, let’s say, is first trying to develop collection policy and long-term archiving policy for born-digital material,” participant P3 says. “And the second thing, the minor thing then, is to digitize material that is, let’s say, special for our institution. The barriers are of course money, what else? Always the same. It takes a lot of time. If you give it away, you need money to have it done. So, this was, we applied for research money from the German Research Foundation and we got money, so we did it on a project basis.”

The advancement of digital library development involved groundwork (large-scale programmatic action aiming at closure on policy relations and planning) that preceded production (project-based digitization). Two early digitization projects feature materials from the most recent period of German history: the Exile Press Journals (1933–45) and *Deutsche Rechts-Quellen* (German Sources for Legal Material; post–World War II period). In the interview with participant P3, the infrastructural aspects are highlighted for both of the projects.

The Exile Press Journals project aimed to digitize the output of German publishers, writers, and artists exiled during the Nazi regime from 1933 to 1945, who “tried to publish often, in German, for the German people who were in that region of the world” (P3). This project extends the scope beyond the German language or output by German nationals to document an era of German history through multiple perspectives and the literary agency of the exile press.

Our law says in German; but with the Exile Press we don't mind. I mean, this is something that would have been printed in Germany if the Nazi regime had not thrown them all out. . . .

No, it is really just this political phase of Nazi terror that we try to get all the materials. And not only the publications, but also letters and manuscripts and everything that is about people who were exiled during that period. And we know that many researchers are very interested in that publication, so they are working all over the world, especially in the United States. So it was a sensible thing to do, to put that on the Net. (P3)

Presented as transnational national heritage, the Exile Press Project embodies the idea of a seamless networked heritage library. Moreover, it constructs institutional history within an imperative of a national heritage national library.

Similarly, the project for the *Deutsche Rechts-Quellen* is an experiment in the "collective or cooperative library" (P3). The project focused on the legal materials published after World War II in the context of partitioned Germany divided among the American, British, French, and Russian territories. According to the participant, the project was conducted between 1996–97 and 1999. At the time of the interview, the Bavarian State Library had already completed its assignment within the working group.

So in these different parts of Germany, different legal materials were published. And now we try to set up a scheme where digitization in Munich and digitization in Frankfurt for different sorts of legal material could be put on the Web with sort of combined indexing or whatever technical problems when one library cooperates, works with that sort of software and the other with a different one. So what are the problems, the issues when such digital collections are thrown together? So the material is something that is sort of local or regional. From a German viewpoint it should come together then, because now it is a German issue. . . . So this was a mixed sort of project. It was not only on digitizing material but on a huge amount of material, but also on all these technical, organizational, indexing, etc., things. So this was [a] very interesting project where all these things came together. . . .

On the one hand it was rare material because it was not published in a large amount of copies. So it's quite rare. It didn't survive at all the places where it was originally kept. So it was an issue of conservation, of getting access via the Net instead of traveling. Because sometimes people now have to compare the legal situation there and there and there; so it's interesting for them to have that all on one table, and it's rare material. So for the user it was a nice concept to get all this material from this short period of time after World War II together. And for us, it was interesting to see how we can merge or integrate different approaches to digitizing our material. (P3)

Production is presented from an administrative and legalistic perspective in which infrastructure, integration, cooperation, and standards are seen

as the ultimate benefit of the effort. The emphasis is on the pragmatics of production rather than on the content side (the semantics), but these levels are collapsed as shown in the fit of the Exile Press Project and distribution of cultural authority to the states, within a networked system. In both of these projects, the national library performs its role as cultural institution, providing a mechanism for obtaining access to knowledge.

The main challenge of German digital library development (after 1999) was to provide public access to the material and to develop a conceptual framework.

There is no extra money coming in. Everybody has to do it on its own. But now we are thinking about what can we do next. I mean, buying materials is fine, it's absolutely a necessity, but the next step might be setting up of a . . . [*hesitates*]. We do have a Web site but nothing more. So what can we do with this material? Can we create a virtual national library catalogue or whatever with just this German material? Because in all our OPACs [online public access catalogs] there is—I mean the OPACs of Göttingen, München, etc.—there is everything they own. So can they draw out what belongs to this national library concept and put it together with other parts of their catalogues to have a sort of [*hesitates*] portal, let's say, to get to these materials? (P3)

Instead of conceptual articulation by means of scalable structures (represented by the Memory of Portugal, the extensible topical kernels of the Gallica, or the American Memory collections), the generalized idea of German cultural heritage does not figure in this narrative. Instead, the “national library concept” is seen in the context of a technological artifact (“a virtual national library catalogue or whatever with just this German material”; P3). The notion of German-language literary and historical tradition instead of a generalized idea of German national culture features in this transformed idea of virtual pan-Germanism. “But then, I think, German culture is even a broader concept because there is Austria,” says participant P3. “I don't want to be imperialistic here, but the German-Austrian culture is so close in history so that it would be nice to have Austria and the German-speaking Switzerland in it so. So it's an even broader concept maybe.”

Within such framework, the concept of a Virtual German Library that includes Austrian and Swiss national libraries, through which a sociotechnical artifact of the digital library system (the virtual library of German culture) can be maintained outside national realms, is not only possible but natural, a commonsense pragmatic resolution for unified German heritage, recognizing the distributed nature of collections in the digital realm.

I think it is a multicultural thing always at the borders of Germany, of Austria, of Switzerland, of course, but there are also the connects [connections?]. And I could give you examples of writers where no German would know that he's an Austrian

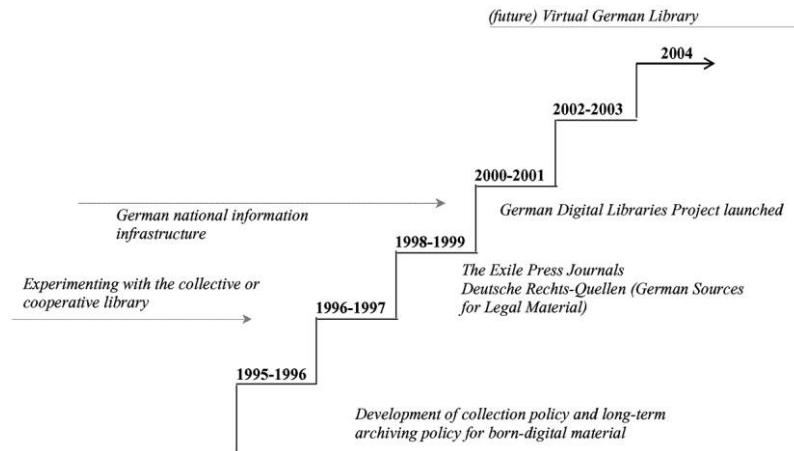


FIG. 3.—Digital library development time line for Die Deutsche Bibliothek

or a Swiss person and the other way round. I think this is a very fluent [fluid?] thing . . . in music, for instance, or painting. And in writing, because it's language related, there is a very broad concept of a culture that somehow belongs together. You can itemize it as far as you want; you go to very tiny regions and say we are different from that region, but then you can also broaden it. (P3)

The problem of multilingual and multicultural histories of these national realms is seen in the solution provided by a multicultural imperative, which can drive the cultural development of a unified Europe:

I think this is what European politics is about at the moment, that we try to create, on a political and economic basis, a united Europe but have cultural specificities, specialties, surviving being very important. I mean, difference being important, although there is a global Europe somehow. So I think libraries can go along with this policy, because we can cooperate, we always did that. With the Internet we have a vehicle, an instrument that allows us to put all this together. And still we are all very different. Everybody does it a little bit differently. So I think that politics in Europe and what libraries would like to do is very near together. (P3)

In this vision of future digital library development and in their effort to build technologies of access, libraries will be managers for the "cultural specificities/specialties" that can be scaled with seamless networks.

The diagram for DB digital library development (see fig. 3) is based on the interview. It shows the future orientation for the Virtual German Library as rooted in the cooperative models of the formative years and the rhetoric (and practice) of development, focusing on infrastructural concerns.

This case study reveals a culture of digital library development that places

a high value on networks of culture outside of centralized notions of heritage. In this case, the pragmatics of access to knowledge resources and the focus on the technologies of circulation (the network of the Virtual German Library) are dominant. This is a view in which access prevails over preservationist concerns and their attached representations (pragmatics, not semantics).

The NLS: "The Nimble North".—Derek Law, university librarian and director of information at the University of Strathclyde, explained in an interview with Linda Emery that "in Europe the countries of the south are asleep, the big countries in the middle (UK, France, Germany) have lots of electronic library developments but no national strategy. The real push is coming from small northern countries such as Finland and Denmark—and I'd like Scotland to join that "club" [10, p. 2]). In Scotland, participant P8 said, "the thinking is coherent; the progress is rapid. So this is referred to as the Nimble North."

In his reference to "the Nimble North," "the Messy Middle," and "the Sleepy South,"¹¹ Law expresses what can only be seen as Scottish-style *discours* about the digital future for Scotland in the European context. Vernacular constructions can become cultural imperatives and can have significant roles in shaping discourses around innovation, as stated by participant P8 in his interpretation of digital library development (and Scottish-style librarianship) as rooted in the Scottish tradition of communitarianism, egalitarianism, and pragmatism (see excerpt from the interview in appendix B).

The digitization program at the NLS was institutionally defined and recognized outside of the national library at the time of the interviews in 2002, a key stage of development. The NLS was then in "year two of hybrid library funding" (P4) by the Scottish Executive.¹² The establishment of the NLS digital program in 2002 and the stabilization of the technological frame for the digital library initiative came after a series of attempts at

11. This categorization is attributed to Nick Moore, British information policy expert and writer on the information society.

12. "Creating Our Future . . . Minding Our Past: Scotland's National Cultural Strategy First Annual Report" (2001) is among the Scottish Executive's key executive documents defining this program (<http://www.scotland.gov.uk/Publications/2001/10/10262/File-1>). The cultural policy statement from April 2004 is titled "Culture, It Defines Who We Are" and includes information about the NLS's objectives to become a hybrid library (<http://www.scotland.gov.uk/culturalcommission/cultural/files/cultural%20policy%20statement.pdf>). The hybrid library program at the NLS involved popularization, engagement with Web-based projects, and participation in the United Kingdom governmental initiatives. These initiatives included providing content as part of Culture Online, integral to the People's Network initiative.

formalization starting in 1995–96. The formation of the Digital Library Steering Group at the end of 2001 was a qualitative shift toward the emergence of a digitization program and strategy for the NLS.

And other things have happened, it's yet another part of the answer to the question number two, and that is that the library set up, and this, this goes back to that last Christmas again [2001]. The library set up a new body. The previous group as I described it, Digitization Steering Group . . . that was terminated but in fact it more or less sort of just died a natural death, and we had a new group called the Digital Library Steering Group. And the Digital Library Steering Group, as its name implies, covers more than just digitization, it's meant to consider all aspects of the digital library. (P4)

The initial experimentation with digital imaging from 1995 to 1996 is seen as continuous to the earlier technology of preservation microfilming. Thus, as a technological function of the library, digitization was understood within the dichotomy of access and preservation.

Well, although it was the Preservation Division that in fact was responsible for the equipment, that's partly because in our library the reprographic services form parts of the Preservation Division. So it isn't just because it was the Preservation Division that funded it, it is not because digitization was seen primarily as a preservation activity. Because I think from very early on, when we began to think about it, because we have such a strong tradition in preservation microfilming, we were never in any doubt from the start that preservation microfilms would be made in the preservation medium, and that actually we'd be using our digitization for access rather than for the preservation. (P4)

The incidental nature of the process and the development through the initiative of interested individuals are emphasized. References to technological objects are prominent as well:

We all grabbed the camera time, or those of us who got things that we wanted to do would try and push ahead and get something done. . . .

The early stages were more equipment led, in that we had key people in the Preservation Division [i.e., reprographic services are integral to the Preservation Division at NLS]. . . . If there was money in the budget that wasn't spent, that was how we actually bought our first digital camera. And then, I think the second one was also the end-of-year money. And then as we bought the equipment, then we started to think of [what] we're going to do with [it], whereas hybrid library development, the actually putting the concept of the hybrid library and putting it into the library's corporate planning, that actually came later than that. So I think it's a fairly clear answer there, we really thought of digitization first, then other digital library material afterwards. . . .

I've said that it was equipment led, that we then have in fact started a few projects, which I would say were really started at individuals' initiatives. In other words, it wasn't a top-down fan development, but first the equipment came and then it was

used for odds and ends. And then my colleague, it's in the Map Division, had this idea of—and they have these marvelous medieval maps called the Pont's maps . . . early manuscript maps of Scotland which are wonderfully detailed, in fact have tiny little pictures. . . . So in fact being able to zoom in on these images is particularly useful. . . . The camera resolution wasn't in fact sufficient to be able to shoot the whole map in one go, so it was done in sections and we then tried to stitch the images together. And that's, in a nutshell, is why [we] now have the second camera after phase one. One of the reasons it was bought was to enable us to capture in single shots large items because we found that there were too many technical problems with trying to join scans together. So we had maps, and then we did Chepman and Myllar. (P4)

In addition to the technological frame, projects at the NLS¹³ and collaborative projects with other organizations are used to organize the chronology of development from 1995.

It's grown and changed quite a lot over time, but I was involved with the earliest experiments in using digital cameras in the National Library of Scotland, and that took place in 1995–1996. . . . But since then, as well as having an ongoing internal national library program which focused on our treasures, our core projects, there have been two big projects funded by external organizations which have scanned large numbers of maps. The first of those, which I'll call the RSLP project, and the RSLP stands for Research Support Libraries Program, and they gave money for a number of digitization projects between 1999 and the present. They are, most of those projects are just finishing up now in 2002. And the RSLP project that I was involved with was called "Charting the Nation." . . . [It] was organized at Edinburgh University and concentrated on scanning all maps of Scotland in a number of libraries from the sixteenth century through to 1740, through to the mid-eighteenth century. And that scanned over 1,200 National Library of Scotland maps over two years, really in 2000–2001. And the second project, which has followed on from that, is the "Resources for Learning in Scotland" [RLS] project, which is the one associated with SCRAN. And you mentioned [gives name of SCRAN executive], the chap you're going to have an interview with. And they'll be able to tell you more about that. But it's a big project across many libraries. In the National Library of Scotland it's allowed 7,000 items to be digitized over the course of the last year, going on into next year. For me, it's involved scanning of over 1,000 maps in February of this year [2002], and those, in this case, were maps following on in time from the RSLP projects. There are maps from 1750 through to 1900. That was the rough span of time. And again, they were all maps that were related to Scotland, either Scotland as a whole or counties or towns in Scotland. And they, in both of those projects I've been the main person involved in organizing what the National Library has done. Sometimes that's involved physically scanning items,

13. "Charting the Nation: Maps of Scotland and Associated Archives, 1550–1740" (<http://www.chartingthenation.lib.ed.ac.uk>) and "Resources for Learning in Scotland (RLS)" (<http://www.rls.org.uk>).

sometimes it's organizing the materials, organizing the metadata, organizing the images and how they're stored in terms of the compression of images, which has been a big focus of everything we've done. And most importantly, really, the organization of Web site access to those images and, although for all of those stages there have been other staff who helped me or worked with me or sometimes done work for me, I've been involved in all aspects really of that. (P5)

The first digitization projects focused on NLS treasures including historical maps (Pont's maps of Scotland) and early modern printed works (Chepman and Myllar prints).¹⁴ In the case of Pont's maps, considering technical requirements for map scanning ran parallel to the construction of interpretive frameworks around the content. Digital surrogates provided access to aspects of the materiality of documents previously not known to researchers familiar only with black-and-white photocopies.

And so lots of people learn different things about those subjects over the course of the five years because, although our Pont maps Web site was not officially launched until 2001, we had an internal Web site that all the people who were researchers could access. And the digital images provided a new impetus for people to relook at these maps. . . . And so, until we scanned the maps, people had often not realized all the different features that were on them. They hadn't read everything properly and couldn't read all of its smaller details. And for the first time it's allowed images to be magnified, often twenty to thirty times, to really see the structure of handwriting, how particular symbols were made up, and where symbols overlap to try to tell apart what was what. The other aspects that often people did not expect to find at the beginning was that there were a number of different people who have also added lettering and text to the maps. (P5)

Recollections of technological innovation and the awareness of the materiality of these documents converge. But above all, it is the newness of the new, a spectacle of technology, that infused meaning into the work of innovation.

In 1996, I presented a paper which just described how we scanned the maps and showed people images of them, which was very exciting then, whereas now it would look very boring, very old hat, because at that time it was much newer. But that paper didn't research anything on the maps, it was just showing the technology, and at the same time there were people who were actually talking about research they had done in the same seminar. That was the only talk I gave that was actually about the technology. I then went on myself to look more particularly at the inks of the different authors of those. (P5)

14. Timothy Pont's maps of Scotland, ca. 1583–96 (<http://www.nls.uk/pont/index.html>); Chepman and Myllar prints are nine of the earliest books printed in Scotland, in or around 1508. See "First Scottish Books" at <http://www.nls.uk/digitalibrary/chepman/index.html>.

Ways in which digital images offered possibilities for new interpretations and evidentiary power of digital images has been significant in conveying these initial experiences with the new medium.

For the first time we could examine the color properties of the inks using a mathematical, or objective, assessment of the color in them. Before then, it was, it would only be possible to do that by some sort of chemical process that might have hurt them. Yeah, that's right. So obviously nothing happened. And people could see with the eye that maybe on one sheet of paper there was very light brown ink, and maybe a collection of darker ones. . . . But it was probably the only research that actually hinged on the digital images. A lot of the other types of research were just assisted by them, because it's allowed people to look at things on the screen considerably enlarged. . . . And it also allowed people to experiment with an image, to try and bring out different features. . . . And so for those types of research the digital images were useful. (P5)

Thus, the shaping of the cultures of reception (by researchers who could find new ways to analyze documents) is one of the defining outcomes of digitization.

Digital incunables were seen as composites of digital representations, contextual tools (commentaries attached to digital images), and the authenticating role of actual documents:

It was important that we showed the results of our five-year project. . . [by bringing] together three different things: one was the Web site of the Pont maps; the second was a book called *The Nation Surveyed*, which was published at the same time; and the third was a traveling exhibition, a set of panels that has been touring around Scotland since August of last year [2001]. And so we knew from 1999 that what we wanted to do at the end of the project was to bring these three things together and say, "This is our formal end of the five-year project." And that's why we timed the Pont's Web site to be finished by that time. (P5)

At the time of the interviews (2002), the process was still open ended, as technological resolutions were opening new frames for interpretation of the documents.¹⁵

And most of our work then consisted of trying to get together various people who were experts in particular fields connected with the maps, to contribute information. With the idea we always had, of trying to make a publicly accessible Web site of the maps. But because the original images were in lots of pieces to cover one whole sheet, it was decided that it would be too complicated to display maps to the world and it wouldn't show the maps to their best, so we were always looking for a better camera. And it was not until 1999 that the library acquired a higher-

15. By 2002, the Pont's maps project was the only one that had been completed. According to participant P4, 40 percent of the maps projects had been completed by then, and the rest were scheduled for completion by March 2003.

capacity camera, which allowed all of the maps to be captured in one digital image. And that digital image was a good resolution, in good enough detail, to see what we needed to see. So . . . those images, we were . . . happy to display on our Web site. So really, work then progressed on putting together the Web site, again much more slowly than I would have liked. And it wasn't until August of 2001 that we actually displayed our Pont maps Web site for the first time. So it really was a project that took five years. (P5)

The Pont manuscript maps became the Scottish digital incunables.

In terms of our overall numbers of maps, it wasn't a key project, as it were. I think it is important. I didn't mention it by name, but at the beginning, I mentioned before RLS and RSLP. I was involved in the early stages in scanning. And our earliest experiments were, in our case, in scanning the Pont's manuscript maps. And so, really, for about three of four years, we scanned and then rescanned Pont manuscript maps, for reasons I can't really explain, because it really is better for some [of] your other questions, because in terms of their overall size of numbers of images, the Pont manuscript maps was only about 50 images . . . and so, compared to these other projects which have scanned a 1,000, 1,200 maps, it gets quite small. But its significance, I think [refers by name to participant P4] is right to highlight, because they are really treasures of the National Library [of] Scotland. They are very important in not just the history of cartography in Scotland, but also the history of cartography internationally. And what we were very keen to do was not just display the images, but provide a lot of supporting information about the maps. And it was that side that took most time, and it was actually, it was very interesting, but very challenging. And the Web site, which later on I can show you, is a big display gathering together a lot of textual information, with images as well, that describes the maps. And I think that's why it's something that he feels it's important, because of that effort in trying to explain something that was a core NLS collection. It's not significant in scale, but it's significant in terms of the end result. (P5)

Their digital format was changing the aura of the heritage artifact, creating a new framework for its circulation and transmission. Remediation is the ability to reevaluate an earlier technology by means of an emergent one [11], comparable to the "museum effect" as digital objects are presented through their digital surrogates [12].

And before then, they [Pont's maps] had only been looked at, at very isolated times. And compared to many other manuscripts relating to Scotland that are very important, like Mary Queen of Scots's last letter, or Robert Burns, the Pont manuscripts have really not been given much attention. And so that's why our project with digital images really showed nothing that you couldn't see by taking a magnifying glass to the original map, but really very few people had ever done that before. And so, the things that people found out related to a lot of different disciplines. Every year for five years we had an annual seminar with speakers on a

whole range of subjects, to present their ongoing research, and that is still continuing now, with a number of projects that really began only two years ago. (P5)

Collections documenting the Scottish contribution to the history of early photography were other milestone digitization projects of that first stage of development, confirming trends in other early digital projects [13].

So obviously, we've done lots of other sort[s] of projects in the meantime. But the Calotype just happened to appeal to me because it's our first—it's not our first, but it's our first sizable project, I suppose, with photographs. Although we had earlier done some photographs. There's another slightly later famous Scottish photographer called John Thomson, and at the library we had an exhibition on Thomson. And we've produced a Web version of that exhibition. . . . So we did a few projects after that.¹⁶ As I said, very much individuals' initiatives, because there was no sort of policy, as it were, at this point. And one of the other things I wanted to say in the importance of establishing the Digital Library Steering Group is that, before that, nobody really accepted any sort of responsibility for digitization and there were simply—nobody could be considered to be in charge of this. There was no clear policy drawn up. (P4)

Technology innovation can be also seen in the context of organizational processes. The following refers to the first organized attempt at digital image management, following a chaotic beginning in 1995–96:

I'll describe later how we sort of began in a rather haphazard way and reached a point at which a number of people, not at the sort of policy-making level, but people [of] whom I was one, that were actually concerned with it at [a] very basic level and realized that we are actually losing control over what we were scanning, and that files were sitting around on CDs on various people's desks, and we didn't have a system of file names, and so on. I think this is probably fairly normal, that when you start you haven't actually organized all these things. And so what we did was to set something up which was largely sort of [a] bottom-up initiative, and it was called the Digitization Steering Group. And what we did there was we pressed for a digitization research officer to be appointed, somebody who would actually have time to do a thorough literature search and search of what other institutions were doing and actually come up with some recommendations on how we should organize ourselves. This is about when we run into funding problems. (P4)

The period 1998–99 was a key stage at which the reframing of the problem occurred together with a push for a digitization strategy. The temporary appointment of a digitization research officer in 1998–99 provided

16. The "Calotype" refers to the "Pencils of Light" collection that documents the "photographic history with 300 images taken in the 1840s by the Edinburgh Calotype Club—the world's first photography society" (<http://www.nls.uk/pencilsoflight/index.html>). For the project on John Thompson (1837–1921), see "The Photographs of John Thomson" at <http://www.nls.uk/thomson/index.html>.

a solution to digital object management and led to the articulation of policy documents.

He [the temporary digitization officer] was very, very good. He came in and listened to us. And he had the sort of right IT [information technology] skills, in that he could set up Access databases. And we started to get it under control. . . .

He put together a policy procedures document. It was more procedures than policy, but it did have actually a section on content policy, or rather on what, how one might go about forming the content policy. And the report that he wrote, the group produced; it was a—they were proposals. But, in fact, I realized when I was carrying out my review recently, I realized that one of the problems was that these in fact remained as proposals, and what was lacking was a very clear sort of from-the-top statement that we accept these proposals and they should be implemented. And this, I think, is because digitization was so spread around the organization that nobody accepted responsibility. (P4)

The arguments about the functionality and pragmatics of digitization focus on the resolution of problems at hand. Nevertheless, they run parallel to a strong need for definitions and for a consensus around technology frames held by different groups in the library. Key stages of development maintain proximity to objects and are structured by objects that fit in the time frame from the mid-1990s to 2002. Within that time line, there were key transformative events dividing the initial development from the mid-1990s, when the first projects were initiated, to the end of 2001 and the establishment of a systematic program of development, with the appointment of a digitization research officer (in 2002) and the formation of the Digital Library Steering Group (in 2001).

In both NLS interviews, participants identify key stages of development by reference to empirical outcomes, facts, and tangible obstacles. This is more pronounced in the narrative of participant P5, who was more closely connected to the curatorial concerns, than in that of participant P4, whose primary role is administrative. Innovation is seen as a mechanism that structures environment as it evolves, rather than through an existing social authority. (This is in agreement with the initial observation during recruitment that institutional frameworks at the NLS seem fluid and collaborative.) The beginning of digital library development is seen as self-organizing, with a high tolerance for uncertainty.

The qualitative shift occurred in 2002 with the public release of the online collections. Although the new uses of the collection have been noted (this is a common observation for builders of the digital libraries of the first wave), the full implications were not yet understood.

I think that it surprised me how fast everything has developed. And five years is such a long time since we started, but really in even human life it is not a long time. And our expectations are constantly—have to move on from what we thought

we were originally doing. And looking back now, . . . I don't think I would ever have expected what we have now available. And so last year we had no maps available on the Internet at all, apart from a few small, little thumbnails. And when we launched the Pont site, we were using these compressed images that allowed you to zoom in and out of the maps. And that was something that took a lot of work to achieve. We tried a lot of different things to get that. So it seemed like we were never going to get there at times. Now, less than a year between then and launching our other Web sites, we now have 1,200 maps of Scotland that are all available in the same way. And the reason why that's happened is because, partly, these other projects I've mentioned, RSLP and RLS, are coming together. But it's also because we have had to effectively try to rush out as much as possible on the back of project Pont. Because what people are wanting more and more and more is content. (P5)

The fascination with new technology replaces the realization of the importance of content, technological consequences, and access.

And I think the main sort of revelation really is that is not enough. Already now we look to what we would like to do. People are saying, "Well, all these images are great but I need to know more about them," [and that] we need to write a text about them. And people are wanting lots of different ways of looking up those images, and we only present them with a small number. People are wanting ways of, say, integrating our collection with other libraries around the world . . . better ways of indexing the material, so that there are more ways of accessing the content. . . . People's expectations are growing at an exponential rate, at an ever-increasing rate. And that means that there's never really a feeling that you can rest on your laurels in this area. You always have to keep going and keep doing more because what you've done so quickly becomes superseded and so quickly looks old-fashioned. And I think that has probably been the thing that I didn't really expect to such a degree. I could have said, "Well, obviously technology would change." But I couldn't have said, "You know, we will get to 2001, launch our Web site, and then will do something else." What we say, "We launch our Web site, so we're all ready before we launch it," we're saying we'll need to do this, and we'll need to do that. And this area is already looking a little old-fashioned. (P5)

In addition, it becomes obvious that one of the consequences of digitization projects is a need to define status as objects rooted in the institutional framework, the NLS. "And you see, the other point is that because at the early stage most of this will in fact be delivered through SCRAN," says participant P4. "Now, the problem is that when people see them on SCRAN, the consequences for us may not be quite the same as if people actually saw all these things on the National Library's Web site." Because of that, the medium of delivery for digital incunables in the existing network (SCRAN) created an ambiguity about reception and viewing for the materials. "So I think that's the second reason why in many ways the consequences for us would take some time to become clearer," says participant P4. "But also, what SCRAN does not give us is—SCRAN works very much

on single image caption data set. Because SCRAN started off, it's cultural objects in SCRAN. As you know, there are pictures of vases and swords and flint stones and so on." This challenge is presented as a problem of object-oriented management—that is, it is inherent in the materiality of objects in relation to the context of the use of digital surrogates [14]. "And the delivery model, it doesn't in fact really cope with something like a multi-page book," participant P4 says. "And indeed, the funding model that is used by which people providing content are paid for it is also based on the single image caption. . . . And they certainly don't actually, as far as I know, have a mechanism for allowing you to proceed through the pages of the book." These statements can be interpreted in light of several concerns around authenticity inherent in this particular type of decontextualized viewing and presentation.

The SCRAN database is a digital library that is conceived primarily as a retrieval machine for large data sets of (Scottish) cultural objects presented as digital images. Thus, in the process of recirculation, authenticity for these objects is reduced to visual tokens as they become standardized for the SCRAN digital environment and its associated uses. While on the surface this concern is about technological limitations of a digital library, it can be read as an argument about the importance of the library framework (and the central role of the national library in managing the cultural authority of heritage objects). Open access is an associated concern.

We are now trying to put in place the infrastructure to be able to organize a delivery of all these things. Because, obviously, we want all these things to be available through our own Web site and connected to our catalogue. So, if these 2,000 broadsides, what we actually want is the catalog record for each of those broadsides to link to the image. But as things stand, when it comes to March next year [2003] the project is finished, people would actually find these things because they're searching on SCRAN, not the National Library of Scotland's Web site. (P4)

In contrast, the contextual links are maintained on the NLS Web site through curatorial efforts and additional information, as full text. The circulation of information about digital surrogates in the context of scholarship and the authentication of documents are uniquely shaped by the national library context.

From the point of view of collection development, digitization is seen as having a close fit with the national mission of the library. The cultural authority of digital objects (Scottish national treasures) and the cultural authority of the national library are seen as mutually reinforcing.

When we are thinking about digitization content, we are actually going to focus much more on how to do primary responsibility than on that more expanded collecting role. So whereas, you know, we actually, we'll accept collections like Esperanto, it doesn't seem to me very likely that we would actually [be] going to

digitize Esperanto books to any significant degree. I mean, we'll have a few shots of publicity, as it were, on our Web site. We don't need to digitize Esperanto books lest it would have to have some particular Scottish importance. But by and large we would see the digitization content policy as being, I think, very focused on the library's sort of primary mission as reflected with purchasing rather than as reflected in the whole range of collections that we have collected over the centuries. . . .

I think you are right in that obviously people will, do see us as putting, making available very much the Scottish content so that will not in fact going to need to make any special provisions for its, for its understanding as such. I think the way in which what we are digitizing and making available, the other effects, I think it is too early to say. I mean, we actually have very little content. This is a huge amount of content compared to what we already have, and very little of this is in fact available yet because the project [Early English Books Online] is still in the middle. (P4)

SCRAN resolved the problem of adoption through the economies of scale and the educational uses of cultural heritage digital objects. While the SCRAN database assumed integrity as a self-standing resource and cultural product, the digital library (as a heritage collection) at the NLS became an issue of organizational transformation (mimetic process). The environmental constraints and the lack of a systematic approach to digitization (need for digital library development to shift from incidental to systemic) were also emphasized.

For us [in the library, digitization] was just, it was an additional activity; it wasn't replacing another activity. It was simply additional, and therefore it made funding demands, and there was no obvious way to meet those demands. And if it hadn't been for some underspenders, we probably wouldn't have acquired the cameras in the first place. But at least when then you get the equipment, then you begin to put together in place somebody to have somebody to start the equipment. And so on. . . . And it was certainly that financial barrier that meant that when that temporary digitization research officer, when his post came to an end, everybody agreed that we needed the replacement, but nobody, we just could not fund it. . . . But that, for reasons I've already explained, that didn't clearly come about. And so this has really left us with something of which we appreciated the importance but in fact had no financial provision for. So that was definitely a big barrier. (P4)

The collection development for the national digital library was dependent on external funding. This reinforced the role for the digital library to circulate the narrative "of Scottish significance" (P4) in an adaptive rather than prescriptive framework.

I think that the National Library of Scotland's digital programs have been quite broad and quite vague because the main problem, I think, has always been that there haven't been sufficient funds, sufficient resources to scan what we would like to do. And so we've always looked for external funding. And these two projects particularly allowed the Map Library to scan a lot of our materials with no charge

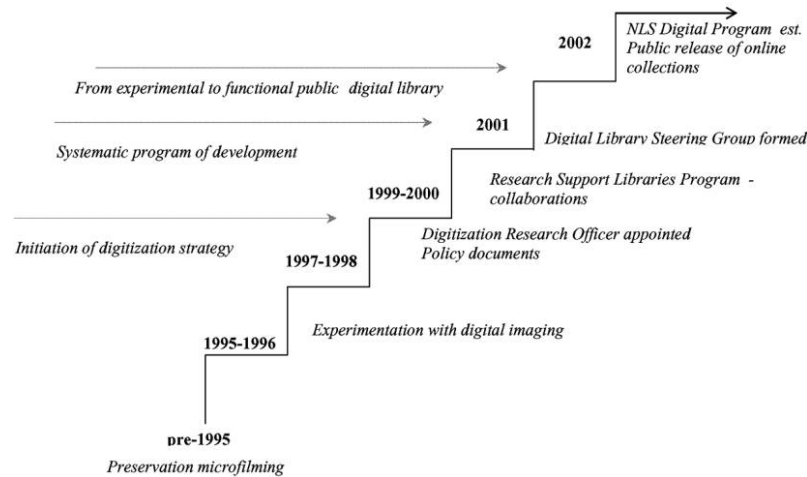


FIG. 4.—Digital library development time line for the National Library of Scotland

to the National Library, or minimal charge. And so we were very directed by what those projects' focus were. In other words, if we had got funding to scan twentieth century maps of England, then we would have done that . . . because we've never decided not to do something because it doesn't fit into the program. I think our belief has always been that any digital material would be useful, if not immediately, then within a number of years, and so we should just take the opportunities offered by external funding to do what we can. So they've only fitted into our program because our program's been quite vague, really, and directed by what external funds were able to support. (P5)

The adapting rather than controlling cultural style predominates in this case and in other instances of a high tolerance for the ambiguity (UAI) and proactive matching behavior. These are the characteristics of the "frontier spirit model" (see table 3) in relation to the environment. In all of these narratives of development, the focus is on tangible outcomes combined with an inductive approach and temporal orientation in which change is seen as positive and open ended. As shown in figure 4, the time line of development for the NLS shows history organized around technological and institutional landmark events, a major delineation being between the experimental and systematic program of development from 2001 (establishment of the NLS digital program).

The concerns about circulation of NLS digital objects in the networked system of SCRAN point to the importance of institutional presentation of culture. Overall, while national culture universals are not absent from these narratives of development because they are implicit in the assumptions

about the cultural authority of the national library, the strategies for digital library development are presented as resolutions to practical problems. The last of the analyses, which focuses on the BL digital initiatives, is presented next.

The BL: "The World's Knowledge" and the BL brand.—The House of Commons Culture, Media and Sport Committee issued a statement in 2000:

We strongly support the British Library in its endeavours to continue its digitalisation of internationally important books and manuscripts. We recommend that, wherever possible, those images should be freely available on the Internet. We consider that support for this process should be considered a high priority for Lottery or Government funding as appropriate. It should be the Government's avowed aim to establish the British Library as a hub for the UK and the international library network. This will enable the British Library to become a universal resource rather than the preserve of a relatively small number of users on the site—a library for the many not just for the few. The expansion of the British Library's role should not be at the expense of and should in no way compromise the performance of the British Library's core statutory functions. [15]

The development of digital initiatives at the British Library was deeply rooted in the largely experimental digitization projects from the mid-1990s (and officially from 1997) and was international in scope from the outset (as shown in the brief chronology presented in Part I). The quote from the House of Commons Culture, Media and Sport Committee statement in 2000 affirmed the importance of digital initiatives within an internationalist framework, as shown in a report by then newly appointed British Library Chief Executive Lynne Brindley [15].

At the time of the writing of this article, the blurbs on the British Library Web site construct a trope in which merging technology, commerce, and public culture ("Treasures in Full: High-quality digital editions, free to your desktop") frame digital collections. The BL institutional repository for knowledge of global significance is thus produced for popular consumption. The cultural authority of cosmopolitan and comprehensive collections and the universalized cultural authority of global knowledge, culture, and heritage in which the British Library provides access to information objects in its collections supplant the traditional concerns of heritage, national representation, and cultural identity that are central in previously analyzed cases. Corporate cosmopolitanism, the BL brand, and the global identity of its collections are a construction and a distinct cultural imperative, an institutional strategy that is articulated not only in the semantics of the Web site presentation but also in the *discours* of development that is presented next. In comparison, the cultural authority of national libraries

examined so far has been framed in the context of national memory, transnational connections, and heritage collections.

The monumental digitization projects initiated at the BL at the time of the interviews in 2002 were becoming cultural icons in their own right, resulting from years of digital library innovation. As one of the pioneers of the experimental era of digital projects at the BL (P6) discussed in the interview, a transition from the Digital Library Program to this new and as yet unstructured stage was under way.

Previously to this, I was—we had a formal program called the Digital Library Program, and I was assistant director at the Digital Library Program. So that was my job title. But we don't have—that program is gone, that emphasis is gone, and now we are shifting towards the e-strategy, slightly different way of approaching this. (P6)

And further:

The library has been restructuring over the last two years, and we now have very recently combined the e-strategy group with the Information Services group, sort of the IT department if you like. And we are still restructured so I don't have a job title at the moment. (P6)

As stated in the historical section about the BL in Part I [pp. 374–75], e-strategy is related to use and accessibility as an evolving code of practice. From its point of origin in 1994 to the transformative period between 2000 and 2002, the digital library initiative at the BL can be examined as the culture of innovation.

The main thing that we did was, in 1994, we set up a program called Initiatives for Access, which essentially was a learning program for us to learn about, see how we could apply all these new digital technologies that were around—the Internet, Web, digitization, character recognition, digitization of microfilm, all those kind of new technologies for libraries. We had a funded program for two years, 1994–1995, that was funded from the library's own resources. . . .

I think the emphasis in those times was on looking at the technology and how we would apply that technology to our services, our existing services, to improve services. (P6)

In the description of the first phase of the Initiatives for Access from 1994, the environmental pressures (“to learn about, see how we could apply all these new digital technologies that were around”; P6) and their adaptation to improve efficiency of existing practices provided impetus for the early digital initiative. Object-oriented mechanisms of organizational frameworks such as the laboratory (an epistemic culture identified by Knorr Cetina [14] are emphasized in references to experimentation and the open-ended process of learning.

At that time, that particular initiative was [a] narrow internal packet. . . . So that program did set up some, was mainly experimental. But we learned a lot about the Web, we learned a lot about the Internet, about HTML, you know, about all these new technologies that were going on. But it was a kind of separate activity. It didn't really have impact at that stage for the main activities of the library. So it was a learning activity, but I think it was quite important. . . .

They were actual practical experiments. We digitized things, you know, we set up databases, we scanned microfilm, we tried to OCR the microfilm, we tried to set up Web sites, etc. So it was very practically based; it wasn't paper study. It was very practical. Nothing got out of these two years. We probably spent a million and a half pounds on those programs. (P6)

This historical retelling locates the technology innovation to a "narrow internal packet" (P6) within the organization and within a digital laboratory, as the world of things translated to objects of learning. Learning rather than technology artifacts is the outcome of these early experiments, captured in the phrase "Nothing got out of these two years" (P6). Thus, the outcome is framed as a beginning: "Hopefully we've learned a lot already, you know, which we can apply to this, and this will teach us a lot as well, for the future. And of course, when we have this available, we can go to other funders and say, look, you know, this is what we've done, this is what we can do. You know, give us the money" (P6). The use of technology to open "more interpretive trails through the material" (P6) in the form of monumental projects was another outcome of the experimental stage. The BL brand developed through digitization of heritage texts that became units for digital development that reached a natural slowdown point at the time of the restructuring.

Currently, at the moment . . . very, very few actually—the major ones being a Gutenberg Bible project, which we did with funding from Keio University in Tokyo. We have agreement with Keio University. They've recently digitized our first "Pilgrim's Tales," Chaucer, printed by Caxton. So the first two things that Caxton printed, so the first two printed books in the UK. They'll be on the Web sometime soon. They are being digitized and they'll be on the Web soon. So that's second very large project . . . with the funding of Keio. And now we are looking at other projects with rare books, early print. Yes, we have an agreement that we'll continue this over a number of years. Maybe one major project a year over a number of years with them. So that's one agreement, one funded agreement. (P6)

Digitization of treasures (now labeled "Treasures in Full" on the BL Web site) included the Gutenberg Bible, Caxton's Chaucer, the International Dunhuang Project, and digitization of materials from newspaper and sound collections.¹⁷ This digitization of treasures was incidental rather than stra-

17. These digitization projects can be accessed, respectively, at <http://www.bl.uk/treasures/>

tegic and was contingent on funding and partnerships.¹⁸ They were not part of the BL's digital collection development strategy. Making the case for an extension of legal deposit for electronic materials was the primary goal of the BL digital program at the end of the 1990s. Experimental digitization of treasures was a small part of the broader environment in which the transition from gopher service to Web site and the implications for document delivery services were explored.

The first BL information server, as we call it, was a gopher, and then some time around 1994–1995, we had our first Web site. So we had a Web presence since about, I think, about 1995. So I think that we recognized fairly early on that the Web was going to be [a] significant thing to do. After that, I think, our emphasis moved and we concentrated on, I think, more on developing our document supply services digitally. Because the big movement we were aware of then, of course, was the electronic journal. And so from, I would think, the second half of the 1990s, our emphasis as an institution was on the born digital, rather than digitized. We did some small digitization activities, but the corporate emphasis was on acquiring born-digital material, particularly e-journals. (P6)

These were the dominant technological frames for the emerging digital documentary culture in 1990s. “Heavy scholarly project[s]” (P6) ran on a parallel time line, with digitization activities of the Initiatives for Access Program resulting in experimental projects with technological solutions to enable scholarly discovery, such as the Electronic Beowulf project.

We first started digitizing as part of that, [the] Initiatives for Access Program. And I think the first thing that we did was the Electronic Beowulf project. The Beowulf manuscript, okay, which was in collaboration with [a] University of Kentucky scholar there. . . . Well, we have the original manuscript of Beowulf, and the people at Kentucky, you know, wanted to research that manuscript, and we decided jointly to take advantage of, you know, these new digital technologies to see what we could do. And one of the issues with them, with the original manuscript, is that it had been burned in a fire, so it was charred around the edges; it's become illegible in some places. And also, that it's, that it's actually a palimpsest. . . . And scholars in Kentucky were very keen to know what the original writings had been underneath it. And by using digital technologies and the new lighting techniques, ultrared and ultraviolet lighting techniques, we could expose what the original writing would be. It was still all the same poem. There wasn't a palimpsest where there's two complete different works, one of them being scratched off and another one put on the top. It's the same work, but the wording is changed, and that was of great interest to the scholars. So with the digitization we could expose that layer. Sometimes there were three or four different layers, scratching out and overwriting, and

gutenberg/homepage.html, <http://prodigi.bl.uk/treasures/caxton/search.asp>, and <http://idp.bl.uk>.

18. The partners included Keio University, the University of Kentucky, the National Science Foundation, and the Mellon Foundation.

we could expose them all. So that was almost the first thing that we did, was that heavy scholarly project around the Electronic Beowulf. And that's available on a CD. (P6)

This participant emphasized the state-of-the-art forensic technologies used in 1995 for the Electronic Beowulf, which is a milestone digitization project and the first attempt at digitization at the BL. Focus on visual representations of core documents is also common to this early technological frame, especially in digitization projects that focus on keystone documents. The digital incunabula revealed layers of documents and enabled new methods for document analysis. (The idea of digital palimpsests had practical and theoretical implications for the digital humanities textual scholarship and the creation of vernacular scholarly archives.¹⁹) Because the digitization activities of the Electronic Beowulf project are presented as technological in nature, the emphasis is on the use of the power of technology to solve problems that are nontechnical in nature [16, p. 353]. In this culture of development, innovation assumes the status of scientific discovery; digitization as a forensic technology becomes a technique for document analysis and authentication, knowledge creation, and understanding of texts.

The process of experimentation and its informality are emphasized, as is the organizational learning that resulted from these early years. Integral to that learning are arguments about the purpose of digitization in relation to institutional goals: "One [of] the issues around digitization is that it's, and as we've worked out our policies in digitization over the years, that we've come to the conclusion that digitization is about access. It's not about preservation" (P6). In an overall approach to digital development, digitization is oriented toward access rather than archiving, a prominent issue of the debate about the status of digitized collections.²⁰

The second BL interviewee (P7) presents the problem of digitization in terms of a problem of storage and manipulation.

And that's what I am really concerned about. I mean, the digitized materials, we're not destroying the original, so we still have that if we don't keep the digital image or if imaging changes, and, you know, suddenly it becomes much easier to produce a much better quality image and that sort of thing. Technology is changing all the time, then perhaps we won't want to keep those versions, we want new versions of images and that sort of thing. So, that's not a high focus for me. I am very much more interested in the things that do not have any other kind of equivalent, so they are only digital material. (P7)

19. Notable among these pioneering projects are the Rossetti Archive (<http://www.rossettiarchive.org>) and the William Blake Archive (<http://www.blakearchive.org/blake>). They both started at the University of Virginia.

20. See, e.g., how this emerged as a significant concern in the study of the National Digital Library Program at the Library of Congress [1, 2].

The digital developments are seen in light of material circumstances: “born-digital materials . . . may be a smaller number now”—in comparison to digitized materials—“but will grow in the future” (P7). They are also seen in terms of social realities (legal deposit replacing voluntary deposit of digitally born materials). In the BL case, digitization is seen as in-process medium, not a means to create repositories of digital surrogates. (Structured collections of digital surrogates would be an extension of an earlier model of the library.) There were also technological barriers to access (“to actually be able to get to the material that we have stored in the system”; P7) and long-term storage of digital images in the digital collections. These barriers were due to the anomalous nature of these materials. Participant P7 speaks about the digitally born materials:

I mean, because it's a new type of material coming in, that's causing all sorts of issues because we need people who can actually, who know how to use it. We have to work out how we are going to document the material. A whole set of new processes for receiving the material and providing access to the material. . . . And then the other problems there would be, particularly what I've seen so far, have been actually developing the system in the context of a whole organization where other issues need to be taken care of as well. So other things need to be done, like providing extra access or, you know, certain kind of bibliographic searching or something like that—rights management, for example. And people tend to start putting it all into one system, making it very, very complex and very hard to build. So that's a problem with this. If you don't have very tough boundaries on the actual system you are building, it can become too big and too complicated. (P7)

The solutions were as much organizational as technology driven (negotiations for a new system ran parallel to the process of restructuring in 2002). “It seems to happen with a lot of the systems that we try to build,” participant P7 says. “Especially if something doesn't fit in somewhere else in the organization, they'll look around and say, ‘Oh well, the new system can do that.’ And so, whichever system happens to be starting up, ‘Oh, maybe it can do that as well.’” Clearly, this technologist sees the process as social, implying the inadequacy of the technological fix solution. The library's involvement with “digital things” and “a lot of digital activity in the library” in 1994 revolved on the “hybrid library” (P6). A long intervening formative period ensued, as shown in figure 5.

And in 2001 there was a shift.

Yeah, 2001 already changed the emphasis from developing a digital library to developing an e-strategy, which is more widely based than just, you know—well, it's building on this idea of the hybrid library, not just the purely digital library. So, at the BL our strategy is, even though we develop digital components, digital aspects, the basic thing that we are developing is really a hybrid library based on traditional materials and digital. So we're trying not to see in service terms, or in too many

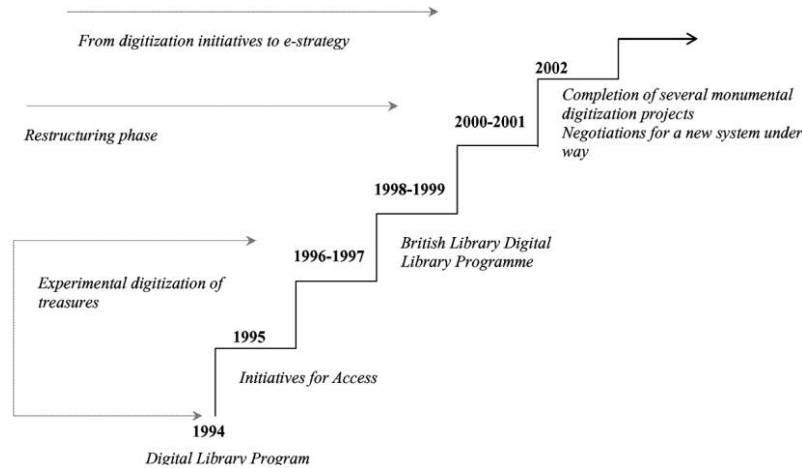


FIG. 5.—Digital library development time line for the British Library

terms, a big divide between the two. So, e-strategy encompasses kind of everything. [laughs] (P6)

Suddenly it seems that the digital library is not seen as a thing in itself or a discrete collection of digital entities that could be embodied in discrete Web sites and objectified entities. Instead, it is part of an overall approach (“encompasses kind of everything”), a fluid mode (“hybrid library”) rather than a digital entity (“purely digital library”; “we’re trying not to see . . . a big divide between the two”; P6). The projects, on the other hand, eventually (by 2007) became integrated through the BL Web site and the “The World’s Knowledge.” The year 2001 marks not only the transition at which digital technologies became invisible but also the time of “cornerstone closure” in which a redefinition of the problem occurs (SCOT framework), as shown in an earlier study of digital library development [1, 2].

The processes by which digitization spread to all segments of the library were also a new beginning, a transition accompanying the new chief executive Lynne Brindley’s changes in the executive team and the physical move of the British Library to its current building. References to “restructuring,” the “new executive team,” “flattening the structure” (reducing the number of directorates), and responsiveness to the environment through establishment of “corporate marketing, which is promoting the institution to its users—not service marketing, that’s separate—but promoting the institution” predominate in the statements of participant P6. Change is seen as natural and integrative. What seems most pronounced in this flux is the BL brand. Adoption of the corporate marketing approach, known

as “branding” in global corporate culture, assumes that identity concerns are framed in terms of organizational (OC) rather than national (NC) or professional (PC) cultures.

The role of the national library is seen in the context of social learning and public good: “It’s more opportunity, more accessibility to learning. . . . We’ve always run exhibitions. We’ve always had people coming to us, general public, though we’re trying to increase that. One of the ways we are trying to increase that is through the exhibition programming on the Web, or the exhibitions on the Web” (P6).

Creating the BL brand is tied to the need to articulate the identity of the library in the aftermath of its move and partly by the need to redefine this cultural institution for the public, but that itself is presented as a continuous adaptive process.

But even within the UK we need to promote a name. Amusingly, just as an aside, [for] many years [the] British Library was called, often called the British Museum Library, even five years ago, in the press. Since we opened this building here, we became established as the British Library in the, in people’s minds. And now, we even find that the British Library was set up 300 years ago, but, I mean, it was the British Museum Library. So we—the circle has really turned. So now, we’ve existed for hundreds of years, whereas in fact we were set up in 1972 as the British Library. So perceptions change. The brands change. So promoting the brand is to our stakeholders, to the higher education, industry, general public. They are all users of the library services. And that’s our mission to serve, you know, very widely. So we’ve restructured to face that task better. (P6)

Institutional history, as in other cases, is seen as determining current development:

I think we always go well beyond that, because when the library was formed in 1972, one of the institutions that came into the British Library was the National Lending Library, Boston Spa. And that was always on a very different basis—that was a service to industry, to education, the copying, providing copies of journal articles, patents, reports, etc., for fee. And of course we still continue that service, so that’s an integral part of the library services and the library makeup. And that’s not a function that, I am not sure that any of the national libraries takes on. So that influences how we approach everything because we are not just aimed at research or researchers or higher education. We provide services to industry, business, commerce, and increasingly general citizen[s]. (P6)

The cornerstone closure in 2001–2 is tied to the recognition of a larger social context in which these developments occur and of technology as a social-technical fix (technology equals tools and people) [16, p. 353]. The criteria for the development of digital materials and the shift of focus on the context and users rather than technologies are integral to the open-ended nature of the process. “It’s just our digitization program,” says par-

ticipant P6. "It doesn't have a real name. But what we are now working on, we've been working on most of this year is, is getting out approvals processes, bureaucratic processes: our approvals processes, our costings, the capacity planning, standards, prioritization, strategy. You know, the whole works. So, from a year ago, we've gone a lot further on than we were a year ago, but we're not quite absolutely there yet. But we have a much better control over what we digitize and why we digitize."

The analysis of the BL case shows the adapting overall orientation, with constituent traits of high uncertainty tolerance, low control, trial and error, and open outcomes; and a focus on hard facts, tangible outcomes, and inductive approaches, as well as future-oriented temporality. Statements about change and transformation were not articulated in relation to outcome but in relation to process and tasks. "Well, it would be providing access, and, yeah, that's the main aim of the library, to provide access to the world's knowledge and that kind of thing, and also to push out live, out there on Internet," says participant P7. "But whether, you know, in ten years time technology may be so different. The systems that I'm concerned with for storing the long-term material may still have access available, but if that doesn't work anymore, then will we still be able to take the images and put them in a new system."

Despite a general awareness that the digital library is an interface "to the world's knowledge and that kind of thing" (P7), and despite the choice of representative cultural texts that reinforce the proprietary institutional goals of the BL through branding, the cultural imperative is not an underlying mechanism for development. This conforms to the identifying features of the matrix organization listed at the beginning of this section.

Summary of Findings

The development time lines for each of the national libraries and the philosophies of development are summarized in a comparative account of innovation cultures, to provide a basis for a theory (and philosophy) in digital library development of the first wave.

Development Time Lines

As already stated, the overall time frame for the study roughly corresponds to the stage of development of the first generation of digital libraries in the European context as they were becoming institutionalized at the mid-point of the "grand challenges-grand responses" phase [17] in 2002, which came at the tail end of the experimental period from the mid-1990s to the public release of the first fully functional interactive digital libraries

Timeline	Stages				
	Biblioteca nacional de Portugal	Bibliothèque nationale de France	Die Deutsche Bibliothek	National Library of Scotland	The British Library
1988					
1989		idea of digitization and the new library building project		preservation microfilming	
1990	national bibliographic data sharing (national libraries' consortium)				
1991					
1992					
1993					
1994		first phase of digitization		experimentation with digital imaging	experimental digitization of treasures
1995	joining <i>Bibliotheca Universalis</i> project >				
1996			collective/cooperative library experimentation >		
1997	public campaign CD-ROM distributed with national newspaper				
1998			national information infrastructure prototyping >		
1999	contextualization of digital objects (Thematic Sites)	from comprehensive to selective thematic-encyclopedic library >		digitization strategy initiated	
2000					
2001				systematic program of development >	restructuring phase >
2002	from experimental to functional DL >	< second project phase		from experimental to functional public DL >	from digitization initiatives to e-strategy >
2003					
2004+			model for Virtual German Library >		

FIG. 6.—Transformative process time line summary for national digital libraries. The tension between events and processes has been resolved in favor of representing the processes as stated by the participants. Therefore, this table does not reflect the objective time lines.

in the early 2000s. Reconstructed time lines for each of the national libraries are based on the interviews and are presented in a series of analytical graphs (figs. 1–5) embedded in each of the library descriptions and integrated in the sections discussing each of the national libraries. Based on these graphs, figure 6 further sums up the years, phases, and shifts for each of the libraries, focusing on the transitive and transformative process as each of the national digital projects progresses through the time period.

Individual periodization for libraries, as in the graphs, is constructivist and corresponds to the narratives. While objective histories in the form of official launching dates for each of the digital library initiatives are given when available (such as February 1, 2002, for the National Digital Library at the NLP), the process of innovation (from initiation to adoption) is a fuzzy and culturally defined interaction of influences, the *discours* that shaped the narrative constructions shared by the participants.

Individualized chronologies additionally consist of landmark events, tracing the beginnings of digital library programs to the early to mid-1990s

(except for the BNF, which started in the late 1980s). The graphs demonstrate unique and nonlinear histories for each of the cases. This is not surprising, but it is interesting to compare their focus.

For example, infrastructural concerns are prominent in the case of DB history, which is process oriented rather than object oriented: the emphasis is on development of a network, on collaborative contingencies, and on the national information policy as a regulative context of agreements, standards, integration of bibliographic resources, and long-term projection to the virtual German-language digital library (as shown in fig. 3).

The beginnings of the NLP time line are associated with international initiatives (European consortium for exchange of bibliographic data on CD-ROM, *Bibliotheca Universalis*; see fig. 1). Nevertheless, local interpretation of heritage in that broader environment (the Memory of Portugal as the public face of the national digital library) is prominent within that context. The prominence of the public campaign and the circulation of the digital library prototype on CD-ROM with the newspaper reinforce a populist educational framework for the national digital library and its intention to be a heritage library for Portugal in the broader European context.

The BNF time line for digital library development runs in parallel to the move to the new building. The starting point (see fig. 2) is “the idea of digitization,” which is the launching point for the technological developments and for an evolving idea of the encyclopedic library of French culture and, later on, a shift in the overall knowledge structure (from a comprehensive encyclopedic to selective-thematic encyclopedic library). This time line itself may be seen as based on some stable notion of French culture, an extension of the national library functions and organization.

The NLS history is organized around technological and institutional landmark events, a major delineation being between the experimental (problem solving) and the systematic (establishment of the NLS digital program) program of development from 2001 (see fig. 4).

The BL time line was the most difficult to interpret from the interviews. It was organized by funding and discrete programs and initiatives and through project completion time lines as the concrete outcome of funded initiatives. The completion of several monumental projects at the BL formalizes the transition from an experimental to a restructuring phase (e-strategy) as the main transformative and transitive strategy that flows into the future (as shown in fig. 5).

The cultures of development are further summarized and compared by focusing on the meanings that were given to the experience of development.

The Philosophies of Development

The notion of imperative [7] is central to cultural analysis applied to

technology innovation. When national libraries are faced with technological imperatives, their cultural authority is engaged in shaping these imperatives. Additionally, cultural transmission that justifies the institutional mission for the national library implies transmission of heritage across media environments. This ensures that the technological becomes intertwined with an existing cultural imperative, which in turn is used to accelerate innovation. This is true for all of the cases analyzed in this study even though their actualizations vary, as does the way in which innovation is controlled through imperatives.

The taglines for each of the case studies—“The Memory of Portugal,” “The Encyclopedic Library,” “The Virtual German Library,” “The Nimble North,” and “The World’s Knowledge” and the BL brand—were for the most part built from the wording in the interviews to capture, in a single phrase, the dominant idea emerging from the interviews for the cultural styles of each of the cases. National libraries were categorized as pyramid- and matrix-type organizations. These initial categories are elaborated in the analyses.

The Memory of Portugal is a cultural and technological object and the official program within which digital library innovation is articulated at the NLP. This “object” serves as a semantic placeholder and a sociotechnical entity to accelerate and legitimate the adoption of digital technology not only in the national library but in the society at large. In this case, the “heritage imperative” has established control of content and participation of institutions and society in the service of maintaining tradition [7, p. 149].

A variation on the centralized networks of heritage (as national heritage, which is prominent in the discourses around the NLP, BNF and NLS) is extended to pan-German, transnational, and multicultural European heritage in the case of the DB, with its vision of the future digital library development based on scaling of the seamless technologies of access. Thus, the argument is built around structure and process. Integration of content around an idea of unified culture is not the main focus. This harks back to the typology of epistemic cultures developed by Karen Knorr Cetina [14] and the contrast of object-oriented with content-oriented epistemic cultures. These cultures define how innovation is interpreted and how work is organized in terms of distribution of social and cognitive authority. In the cases examined here, the social authority mechanisms are pronounced in the context of the NLP and the BNF because they similarly operate through a centralized process by means of a blueprint of development in which the cultural imperative is dominant in driving adoption and justifications and legitimacy of digital library innovation (content-oriented epistemic cultures). In the case of the DB and other matrix-type

organizations, it is to be expected that object-oriented approaches in these contexts will also be decentralized (NLS, BL).

Vernacular constructions can become powerful cultural imperatives. As commonsense knowledge, vernacular constructions can translate to heritage management and meanings attached to cultural specialties (as voluntary, ideological, and programmatic courses of action). This is demonstrated most explicitly in the interpretation of digital library development in Scotland, captured in the reference to the Nimble North and the assertion that “the thinking is coherent; the progress is rapid” (P8). The specificity of the uniquely Scottish approach to digital library development is presented in relation to the communitarianism of the professional library community in Scotland (see interview excerpt in appendix B).

The question of the degree at which self-representation informs reasoning constraints and provides a blueprint for social behavior must remain open. Nevertheless, the explicit nature of such reasoning in managing identity concerns in the process of shaping heritage specialties is obvious and points to ways in which localization shapes the production of culture and knowledge. The idea is that individual libraries were becoming managers for the “cultural specificities, specialties” (P3) in these seamless networks, which translates to the idea that “heritage management” shifts from “specificity,” as something that is intentional and performative, a local heritage product for the larger European mosaic, to the offering of cultural “specialties” within a seamless and borderless network.

Similarly useful insights have come from observing knowledge structures and conceptual frameworks within which national libraries perform their institutional identities in building repositories of cultural texts. The assumptions about culture are revealed through their general approach to classification of knowledge for the national digital library. The examples of the Memory of Portugal and Gallica are obvious metaphors for the ordering of knowledge schema privileging academic knowledge and its various fields. Such organization has been common to curricula, libraries, and encyclopedias. Although contrived and static, the practical advantages of such an approach are in the emphasis of a knowledge continuum within which circulation of cultural objects (paper to digital, for example) and learning can be continuous and new knowledge can fit easily into traditional frameworks (because it affords for expandable and cumulative constitutive elements, in references to extensible kernels and “memories” in the plural in the case of NLP). At the same time, this system of knowledge organization preserves canonical orders and propagates them within the existing institutional framework. The national memory icon (Gallica, Memory of Portugal) further implies a universal, generalizable, and static order of knowledge, a map of unchanging reason that can accommodate cultural representations and heritage as object. This strategy for managing identity

(localization) and coherence for the digital repositories of cultural texts defined collection development policies in these two institutions, with the national library at the center of and the main agency in shaping that identity.

In the case of NLS, the work of heritage building proceeds quite differently. The individual projects—Pont’s maps, “Pencils of Light,” and “The Photographs of John Thomson”—are clearly strategic from the point of view of heritage management because of their connection to the history of practical technologies and inventions, maps and geographical knowledge, and the Scottish achievement. They clearly present heritage icons and the record of uniquely Scottish experience. And yet there is no overarching theme or explicit hierarchical organization of knowledge that these digitization projects need to fit. They are presented as journeys of technological discovery, aggregative and cumulative, without recourse to knowledge universals or monumental and comprehensive visions of national identity. A focus on analytical and technical readings of these heritage icons (Pont’s maps, for example), experimenting and tapping into the forensic capabilities of digitization to provide reinterpretation of these texts, is also significant in its emphasis on technical knowledge. The other characteristic of this style is an open-ended nature of the process and the multiple contexts of circulation (through the SCRAN database²¹) within which digital objects can be framed in the context of popularization of Scottish heritage, thus expanding the audience (although not without concerns about authenticity and loss of context, as shown in one of the interviews). This case study reveals a culture of digital library development that places a high value on networks of culture rather than on the centralized notion of heritage managed exclusively by the NLS. At the same time, these heritage products are also creating powerful placeholders for Scottish identity in the digital realm and are to be circulated for education, scholarship, and tourism—the various realms of a heritage economy.

The localization processes for digital library development in the case of the DB is tied to its organizational setting and the limitations of its collections. The emphasis on the virtual German library introduces pan-Germanism as the principle for localization.

In contrast to these initiatives, which present different approaches to localization and to some degree engage “cultural specificities” in producing

21. As an educational resource provider and an early form of digital resource aggregator, SCRAN encompassed the widest network of institutional users in Scotland at the time. Although aimed primarily at schools, it evidently had a broader user base. In the words of its founder and director, “SCRAN is not at the university level. However, that being said, it is used extensively at the university level” (P9). This entity had an important role in the delivery of digital objects in Scotland in this first period of development, before the digitized collections became available through the NLS Web site.

“cultural specialties,” the BL subdues heritage discourse by focusing on its treasures in a spectacular fashion. Presented as individual spectacles, the Electronic Beowulf, the Gutenberg Bible project, and Caxton’s Chaucer are localized but nonnational narratives built around the origin and uniqueness of individual digital products. Thus, the emphasis is on the (collections’) property regime prominently featuring the BL brand. One can read this approach as an equivalent of corporate globalism [18]. Branding is justified partly by the need to articulate the identity of the library in the aftermath of its move and partly by the need to redefine this cultural institution for the public, itself presented as a continuous adaptive process. In this instance, and in other instances, institutional history determines digital library development. In the case of the DB, its short history as the national library (established in 1912) is an imposed limitation on the depth of the archive (in public access due to the copyright wall). In the case of the BNF, the reference to the “idea of the digital library” is one contingent to its preparations for the move to the new building in the 1990s, which inspired among other events the traveling exhibition *Creating French Culture* [19], now an online exhibition at the Library of Congress Web site.

The Questions That Remain

Is cultural authority (of national libraries) a useful construct for understanding national digital libraries?—Digital heritage is an expression of national identity concerns, and national libraries are the prime agencies of the digital heritage mandate. The process by which this manifests itself can be seen as one in which concerns of technology and culture are coming together, as argued earlier around the notion of cultural imperative. There is an inherent limitation in seeing (digital) national libraries as representative heritage products in the digital realm, because we need to take into account an overall trend for these developments, as discussed elsewhere [20, 21]. In countries in which national libraries have not taken the lead in developing a national digital library infrastructure during the first wave of digital library development discussed here, this is most pronounced because such developments originate from the grassroots, in the form of vernacular archives (for scholars by scholars) and amateur projects, as well as the specialized projects—as shown by Daniel Cohen and Roy Rosenzweig in their analysis of digital history [22]. Heritage institutions other than national libraries have been active producers of heritage in Europe and elsewhere [12]. Ultimately, as one of the interviewees in this study observes, the fluidity of networks shapes development:

I certainly feel that you can have a national digital library that is only partially connected with the National Library. And in fact, it’s my view that national libraries on their own are not in a position to create national digital libraries, that they can

only do this in cooperation with other organizations. . . . I know, in some countries, the national library will have this role, and they will have sufficient resources to attempt to do it. And I still, my opinion [is] that they will not succeed because it is not just the question of resources but of local cooperation in a national environment to make these things work. And the situation in Scotland I certainly find interesting because the National Library of Scotland has only recently started to look at digital libraries. But they are looking at digital libraries within their own institutional framework . . . for legal deposit reasons, for national bibliographic reasons, and for national preservation reasons. These are the three main roles of the National Library of Scotland. Those roles are evolving and being redefined as we speak, but as well as what's going on with the National Library of Scotland, I am aware and connected and work with a lot of other parallel developments which are going on, where the National Library is a participant or an observer or an advisor but does not own the entire activity. So I think you may find this interesting to support the work you're doing. Because if you're just looking at the national libraries because that doesn't imply [a] certain view by the government, for example, on these things. And that, in turn, drives the policies and directions. Again, I would, I would say that the situation in Scotland is very fluid. (P8)

Are vernacular constructions of national identity relevant in understanding digital library development? Are they teleological?—The extent to which a particular cultural imperative is significant for technology innovation can only be explained in a limited fashion—through interviews with a few informed individuals. This method has limitations, but the importance of self-perception in understanding local innovation in a broader cultural context should not be underestimated because of the insights that a native point of view can offer. This study assumes that innovators operate within an awareness shaped by such vernacular constructions of national identity (and how they shape technological frames), which can be teleological. How national identity can extend itself on a virtual scale is presented in this excerpt from the interview with the manager of SCRAN.

We work with institutions actually across the world because the project is for digitizing stuff that's in or of Scotland. So we took [the] decision right at that the start not to—there's a danger of just digitizing haggis and tartan. So we decided that anything that was collected in Scotland could actually be digitized. That means we've got Degas or Raeburns [Sir Henry Raeburns, Scottish painter, 1756–1823] or whatever on the system because they are imported collections in Scotland. But we also went outside Scotland to source material that's important to Scotland's history that may be held elsewhere. So, an example of that would be the British Lewis Chessmen [now in the British Museum and the Museum of Scotland in Edinburgh], little chess pieces made out of ivory that are from the Viking period. They are one of the first chess sets that have been found in complete enough format. They are a very important part of Celtic art, and they were found on an island off Scotland, the [Isle of] Lewis, but except for eight pieces, all the other

pieces are now in the British Museum in London. So, for instance, that sort of thing was digitized. The Roy Maps were held by the British Library. [Scanned images of William Roy's Military Survey of Scotland, 1747–55 (at NLS), are displayed on the SCRAN Web site. Roy's map covers mainland Scotland.] General Roy was, when England was warring with Scotland, General Roy was commissioned to make a set of maps of Scotland, which predated Ordnance Survey. They were really the first Ordnance Survey maps in the world that then allowed General Wage to commence to build the road infrastructure in Scotland. And the whole reason for this was so that the armies could get to quell the clans, okay? Those maps are held by the British Library. Again, we digitized them from the British Library. We've also digitized a few items from other sources in Australia and Canada as you might expect, but the mainstay of the material we've digitized is in Britain. But we work with a number of institutions: universities, libraries, [and] museums right across the UK. (P9)

Conclusion

This article provides a historical foundation for the early days of digital library development. The descriptions and analyses of the narratives of digital library development presented here provide insights into innovation in national libraries in Europe. The five libraries selected for the analysis are representative because of their distinct histories and institutional cultures. Together, for comparison of patterns and models of development and typologies, they and similar studies can be extended to other innovation contexts. The typologies presented here are contingent on the argumentation presented in the descriptive case studies and theoretical frameworks for interpretation. The insights as well as limitations of typologies are those inherent in qualitative analyses and explanations.

The period of digital library development analyzed here was important for the stabilization of meanings around technology, around digital surrogates, and around digital collections and for arguments about the purpose of digital libraries—are they tools for access or a medium for preservation? A dichotomy of access versus preservation dominated the semantics and constructions of the first wave of digital libraries from the mid-1990s to 2002, as did understanding the meaning of migration formats in the library community.

Construction of digitization as a form of recirculation of documents and culture can also be seen in light of postindustrial data processing and disjuncture between content and presentation [23, p. 62], in which an access focus affirms the dichotomy of a discursive circuit in which presentation is multifaceted and representational. Thus, “a single description of content at the source can thus be molded in typically postindustrial fashion

to a decentralized variety of consuming programs, formats, and usages” [23, p. 54]. In the context of building a unified heritage (what the national libraries are poised to do), one can only aim at the collections of cultural fragments. The palimpsest—a signifier from the world of physical documents—allows for the dichotomy of content and presentation and acknowledges that presentation is unstable. This instability of presentation is embedded in the enterprise and personal productivity software that Alan Liu calls the “Discourse Network 2000” of the postindustrial epoch of technological-social development [23, p. 62] (referencing Friedrich Kittler [24]). This study focuses on institutional aspects of these macro-social-technological developments at the media juncture of which an inherited discourse network of print culture is being transformed by new technological media.

Appendix A

Interview Guide

1. Please briefly introduce yourself in terms of your background, work experience, and position in the institution.
2. How would you describe your involvement with the digital library initiative at your institution?
3. Can you identify the key stages of the development of the digital library initiatives in your institution?
4. What were the major revelations for you in managing the process of building digital libraries in your institution? What were the major barriers for the institution in developing your library digital library initiative (in terms of developing content, methods of delivery, resources)? How does this differ from your initial expectations of what would be the major obstacles in managing the process of building the national library collections?
5. What do you think is the uniqueness of that process in your institution?
6. What do you believe is the nature of collection development for digital libraries in relation to cultural heritage? How does this process differ in relation to traditional collections? State several items that highlight the similarities. State several items that highlight the differences. Give examples that show how digital libraries are distinct from traditional collections.
7. What are the features of your collection that would appeal to someone looking from the outside, from a different culture, at the materials you have digitized? What are your concerns related to national and international context of use? How is the availability of the documents on the Web affecting the selection processes?
8. Are you aware of the new uses of the collections or the library resources

- as a result of your library digital projects? Please give several examples of how the uses of the library have changed specifically as a result of the new projects. How does that affect the mission of your library?
9. What are some of the strategies that you have applied in your digital library pages for different types of audiences and uses?
 10. Who is involved in the development of the digital libraries in your institution? Are the librarians only involved in the process of negotiation? Provision for input by non-librarians? State external forces involved in policy-making related to building digital libraries.
 11. Choosing two institutional digital library initiative subparts that you are most familiar with, please identify the criteria for selection. How do they differ?
 12. Again using the same two projects, describe the process of negotiation that went on in building the digital collection: who was involved, how was the work organized, what were the units affected by this process?
 13. Reflecting on the same two projects, identify what went well, and what were the crises you encountered.
 14. In all, how does the approach in your institution differ from other institutions?

Appendix B

Interview Excerpt with Participant P8

P8: This phenomenon has been remarked on many times. Usually, librarians from other parts of the UK are astonished that Scotland can do so much with so little. And that the answer to this is also the answer to your question: there exist a number of factors which, when brought together, make this happen. These factors are the geographical distribution of [the] professional population in Scotland. Approximately 80 percent of all librarians live within one hour's traveling distance of each other because they are concentrated in a central belt between Edinburgh and Glasgow. There are further pockets in the Dundee and Perth region and another in the Aberdeen area. And those are the major centers of population, and there are literally only three, then, small bits that join up quite nicely. So it's very easy to organize meetings. The size of the country seems to be just right, neither too small nor too big. There's a critical mass of professional activity which allows these meetings, these councils, these committees, to be self-sustaining, but it doesn't make them unwieldy. There are many such organizations in Scotland, and therefore the librarians tend to meet each other on a very, very frequent basis, even if it isn't planned. So the informal exchange of information is very high.

MD: It seems people really work together. They do.

P8: The second is the communitarianism, which is a cultural artifact. It could be, it's been referred to as the "Nimble North" before. Northern countries of Europe—Scotland, Finland, Sweden, Denmark, Norway—all have advanced

digital library manifestations. In different modes, but they are all very advanced. The thinking is coherent; the progress is rapid. So this is referred to as the Nimble North. And it's, who knows, maybe it's those long, dark winter nights which force people to go to communal spaces to save energy. And if you are in a communal space, you have to learn to get on with people communally. Which leads, if this goes on for centuries, this leads to communitarianism.

REFERENCES

1. Dalbello, Marija. "A Phenomenological Study of an Emergent National Digital Library, Part I: Theory and Methodological Framework." *Library Quarterly* 75, no. 4 (2005): 391–420.
2. Dalbello, Marija. "A Phenomenological Study of an Emergent National Digital Library, Part II: The Narratives of Development." *Library Quarterly* 75, no. 4 (2005): e28–e70.
3. DiMaggio, Paul, and Powell, Walter W. "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields." *American Sociological Review* 48, no. 2 (April 1983): 147–60.
4. Schneider, Susan C. "Strategy Formulation: The Impact of National Culture." *Organization Studies* 10, no. 2 (1989): 149–68.
5. Geertz, Clifford. "Thick Description: Toward an Interpretive Theory of Culture." In *The Interpretation of Cultures: Selected Essays*, pp. 3–30. New York: Basic, 1973.
6. Lowenthal, David. "Fabricating Heritage." *History and Memory* 10 (1998): 5–25.
7. Urban, Greg. *Metaculture: How Culture Moves through the World*. Minneapolis: University of Minnesota Press, 2001.
8. Kimble, Chris. Technological Determinism and Social Choice. <http://www.chris-kimble.com/Courses/cis/cis4.html>.
9. Favier, Jean. "The History of the French National Library." *Daedalus* 125, no. 4 (Fall 1996): 283–91.
10. Emery, Linda. "Derek Law Opens His Mailbox." *SLAMIT Update: The Newsletter of the Multimedia, Information and Technology Group (Scotland)* 28 (October 2000), 2. <http://www.slaite.org.uk/files/pdf/cilips/mmits/update28.pdf>.
11. Bolter, J. David. *Writing Space: Computers, Hypertext, and the Remediation of Print*. 2nd ed. Hillsdale, NJ: Erlbaum, 1991.
12. Tang, Muh-Chyun. "Representational Practices in Digital Museums: A Case Study of the National Digital Museum Project of Taiwan." *International Information and Library Review* 37, no. 1 (2005): 51–60.
13. Dalbello, Marija. "Institutional Shaping of Cultural Memory: Digital Library as Environment for Textual Transmission." *Library Quarterly* 74, no. 3 (2004): 265–99.
14. Knorr Cetina, Karen. *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge, MA: Harvard University Press, 1999.
15. Brindley, Lynne. "Taking the British Library Forward in the Twenty-first Century." *D-Lib Magazine* 6 (November), 2000. <http://www.dlib.org/dlib/november00/brindley/11brindley.html>.
16. Layne, Linda L. "The Cultural Fix: An Anthropological Contribution to Science and Technology Studies." *Science, Technology, and Human Values* 25, no. 3 (2000): 352–79.
17. Phillips, Margaret E. "What Should We Preserve? The Question for Heritage Libraries in a Digital World." *Library Trends* 54, no. 1 (Summer 2005): 57–71.

18. Bauman, Zygmunt. *Globalization: The Human Consequences*. New York: Columbia University Press, 1998.
19. Tesnière, Marie-Hélène, and Gifford, Prosser, eds. *Creating French Culture: Treasures from the Bibliothèque nationale de France*. New Haven, CT: Yale University Press, 1995. <http://www.loc.gov/exhibits/bnf/bnf0001.html>.
20. Dalbello, Marija. "Historian as User of the Internet Archive: Historical Record on the Web, from 'Way-Back' in 1996." Workshop presented at the Libraries in the Digital Age (LIDA) conference, Dubrovnik, May 24–29, 2004.
21. Dalbello, Marija. "Scholarly Editions, Historians' Archives and Digital Libraries: The Pragmatics and the Rhetoric of Digital Humanities Scholarship." Presentation at "Interrogating the Social Realities of Information and Communications Systems" preconference workshop, American Society for Information Science and Technology, Austin, TX, November 4–6, 2006. <http://dlist.sir.arizona.edu/1473>.
22. Cohen, Daniel J., and Rosenzweig, Roy. *Digital History: A Guide to Gathering, Preserving, and Presenting the Past on the Web*. Philadelphia: University of Pennsylvania Press, 2006.
23. Liu, Alan. *The Laws of Cool: Knowledge Work and the Culture of Information*. Chicago: University of Chicago Press, 2004.
24. Kittler, Friedrich A. *Discourse Networks 1800/1900*. Translated by Michael Metteer and Chris Cullens. Stanford, CA: Stanford University Press, 1990.