A FRAMEWORK FOR CULTURAL HERITAGE DIGITAL LIBRARIES

IN THE DEVELOPING WORLD: ACCESS TO NON-TEXTUAL INFORMATION

FOR NON-LITERATE PEOPLE IN MOROCCO

By

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ABSTRACT OF THE DISSERTATION

A Framework for Cultural Heritage Digital Libraries in the Developing World:

Access to Non-Textual Information for Non-Literate People in Morocco

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The purpose of this study is to investigate the role that Digital Libraries (DLs) can play in the transmission of information for non-literate people in the developing world. People from oral cultures are well-positioned to exploit DLs as a way of accessing audio-visual (A/V) documents if the DL is properly adapted. Cultural heritage documents created by researchers during fieldwork may be audio, video, or images that can be sources of national pride for non-literate citizens; these documents could be stored in a cultural heritage DL (CHDL) for online access by non-literate citizens. The primary methodology employed in this study is a review of relevant literature. National culture and universal usability contribute to cultural usability, the human aspects of DL use being explored. Machine aspects of DLs are investigated within the Library and Information Science (LIS) framework, with an emphasis on theories of organization of information and information retrieval, and a complementary discussion of the read/write Web. The concept of DL interface as intermediary between humans and machines is explored in the

context of the developing world. Supplementary methodologies for approaching the problem of access for non-literate users in the developing world include ethnographically-based reflections on daily life, opportunistic conversations with colleagues in Morocco during a 10-month Fulbright teaching grant, and a content analysis of Moroccan Web sites. The resulting framework considers the differences between Western and non-Western cultures in terms of system structure and interface design in light of the "mental programming" of non-literate users. Contributions of this study include recommendations for ways to meet needs of non-literate citizens, with an emphasis on the role of the community instead of the individual. This study recommends that each national culture be studied in order for a successful CHDL to be created. It also outlines a paradigm shift in library services in the developing world to consider the provision of access to A/V materials for non-literate citizens through DLs. Suggested future work includes the creation of a CHDL with read/write functionalities supporting contributions by non-literate citizens to democratize information creation along with access.

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Moulaison, H. L. (2008). Exploring access in the developing world: People, libraries, and information technology in Morocco. *Library Hi Tech, 26*(4), 586-597. doi: 10.1108/07378830810920914

Moulaison, H. L. (2008). Social tagging in the Web 2.0 environment: Author vs. user tagging. *Journal of Library Metadata, 8*(2), 101-111. doi: 10.1080/10911360802087325

Dedication

This dissertation is dedicated to Nadia.

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Chapter 1

Introduction

1.1. Background

The purpose of this study is to explore cultural usability and systems aspects of an

online Digital Library (DL) of non-textual cultural heritage documents for non-literate

users in the developing world. Emphasis is on the construction of a system based on

national culture that meets universal usability principles for democratic access. These

twin components of cultural usability can be paired with a study of systems or technical

aspects to enable the creation of a framework for adapted interface creation. This research

aims to describe a cultural heritage digital library (CHDL) with a localized interface that

could be implemented in a developing country immediately, and will also describe future

work that could encourage a more robust CHDL.

The framework and models put forth are applied to theoretical problems of

usability in the developing country of Morocco. A Fulbright Senior Scholar grant (2008-

2009) gave me the opportunity for extensive observation of the Moroccan information

environment over the course of an academic year while I was teaching at the École des

Sciences de l'Information (ESI) in Rabat, Morocco. The framework put forth in this

study, when combined with in-country experience in Morocco, inform the possible

creation of a CHDL for non-literate Moroccan citizens.

1.2. Significance of the Study

Few studies have looked at design and usability of computer interfaces from the

point of view of non-literate users. No frameworks exist to guide in the creation of a DL

for non-literate users despite the plausibility of such systems and the perceived benefits

of their use. This study is the first to consider that "cultural usability" or usability studies based not at first on the individual user, but on the culture of the user, can be a useful tool in the creation of adapted and localized interface design. The design of the interface, the organization of the information, and the retrieval mechanisms are jointly considered the "systems aspects" that allow the technical access to the content of the DL for non-literate users. Systems aspects have been explored in the literature as they pertain to non-literate users from the developing world. Each national culture will require an adapted CHDL that conforms to user expectations for the machine or systems aspects. Specifically, it is the interface that will serve as an intermediary to that system, thereby functioning as a surrogate for a community member. In mimicking information structures in place in society, CHDLs should be as integrated as possible into the culture of the user in order to promote use.

Through the use of models, the current study will arrive at a framework for creating and implementing a basic CHDL for non-literate users. It will explore ways in which this basic CHDL interface can be modified in the future to better serve the needs of users.

1.3. Research Questions

A series of Research Questions (RQs) emerge when considering the cultural and technical aspects of the problem of access to non-textual documents for non-literate citizens of developing countries. Two RQs pertain to cultural usability, two to systems aspects, and one to possible implementation as a case study.

Cultural Usability:

RQ1: Should we attempt to provide online access to information for non-literate citizens in the developing world?

- Can members of an oral culture benefit from digital libraries, and if so, how?

RQ2: Can the study of cultural usability contribute to the body of knowledge in the field of human-computer interactions (HCI)?

- How does culture affect HCI?
- Can an understanding of culture and obstacles to access inform DL design and promote usability?

Systems Aspects:

RQ3: How can LIS theories inform the creation of a DL system for non-literate users?

- Which aspects of organization of information theory and information retrieval theory can be applied to the special problem of a CHDL?
- Can and should systems be adapted to meet non-literate user needs?
- Do practices evident in the read/write Web enhance CHDL systems?

RQ4: What are the elements of DL interfaces that must be adapted for non-literate users and how should these elements be implemented?

- How should CHDL interfaces adapt to culture?
- How should CHDL interfaces adapt to level of literacy?
- How should CHDL interfaces adapt to level of development?
- How can DL systems be enhanced to facilitate current and future usability?
- How does LIS theory assist in these design questions?

One final research question represents the synthesis of the other two lines of questioning.

RQ5: How is Morocco illustrative of problems of culture, literacy, and development?

- Can a case study of Morocco inform the study of access in the developing world?

By exploring these questions using appropriate methods and with the country of Morocco as an illustrative case study, it is possible to create a conceptual framework that can be applied to CHDL, DL, and interface creation to facilitate information access (Universal Usability) and promote meaningful contact with information systems (adult education and continuing education) for non-literate citizens in the developing world.

1.4. Goals and Justification

Oral cultures are well-positioned to exploit digital libraries as a way of accessing online information that is non text-based. Citizens of the developing world are already

using mobile phones in ways that are creative. Development based on them has included new methods of phone-based beeping between seller and buyer, the creation of airtime as a kind of currency, and the business of phone repair, removal of components, and resale. Mobile phone use, a type of person-to-person contact, remains far ahead of Internet use (Heeks, 2008), which nonetheless allows a more robust communication model. Non-literate citizens have as much of a right to access information online as any other citizen. In his message at World Press Freedom Day 2008, United Nations Secretary-General Ban Ki-moon stated, "access to information empowers each one of us to transform our lives and our communities. Just as water is essential for life to grow, knowledge sustains our capacity to imagine and to change" (Department of Public Information, 2008). One way to offer information is in the form of audio-visual (A/V) documents relating to cultural heritage. In order to provide this access, localization of the interface will have to be considered for every national culture. Localization can be defined as "the process of providing the culture-dependent component of a particular target culture" as a means of adapting the product for use by a particular group of people (Yeo, 2001, p. 104).

This research aims to explore how library and information science theory can be used within a context of national culture to develop a meaningful and usable digital library of cultural heritage electronic documents for non-literate citizens in the developing world. A framework for creating a digital library interface in accordance with relevant principles will be presented. As a means of concretizing the resulting DL, a prototype for Moroccan users will be described.

1.4.1. Perceived benefits

The provision of relevant information on cultural heritage to a traditionally disenfranchised user group through adapted access is the goal of this project. I identify

three main perceived benefits to the non-literate users' successful interaction with information technologies. As a result of universal access to appropriate content, users will develop new sets of literacies:

- Progress in the use of new technologies (task-based literacy)
- Become familiar with computer hardware and software (computer literacy)
- Gain familiarity in the Web environment (Internet literacy)

These three outcomes produce literacies that can be related to the continuing education needs of citizens in developing countries as outlined in *Goal 4: Literacy* of the Dakar Education for All Goals (Global Monitoring Report Team EFA, 2008, p. 16).[1] Although a framework for providing universal access is not included in this research, it is acknowledged to be an essential part of the provision of cultural heritage documents via the Internet. Unlike library projects promoting literacy, this research is not seeking to educate users in traditional skills such as reading and writing and the development of traditional literacy skills is not one of the perceived benefits of a CHDL as outlined here. In the discussion that follows, education and traditional literacy will be portrayed as culture-bound institutions and skills that are not necessarily compatible with citizen's "mental programming" in cultures of developing countries. This research does not seek to modify citizens' behaviors; instead, it seeks to teach a new skill set that is entirely in line with the local culture. It does not preclude a move toward literacy on the part of individuals who come in contact with the system, who by virtue of their own unique personalities, may want to pursue further study and develop traditional literacy skills on

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[1] "160 governments gathered at the World Education Forum in Dakar, Senegal, [in 2000] to adopt an ambitious Framework for Action aimed at expanding learning opportunities for children, youth and adults. At the heart of the Framework is a pledge to achieve six Education for All (EFA) goals" (Global Monitoring Report Team EFA, 2008, p. 6).

their own. Instead, this project envisions finding a way to serve a group of users that has

not historically been the focus of research in this field.

In the CHDL for non-literate citizens of the developing world, universal usability

complements universal access. After having secured access, users must be able to call up

documents in the DL and understand the documents that are retrieved. Perceived benefits

of universal usability are the following:

- Gain familiarity with and confidence using Internet technologies
- Encourage other members of in-group's use of new technologies
- Become a voice in the globalized online conversation of the read/write Web
- Increase quality of life through the repeated use of new technologies

It is anticipated that the individual user will benefit from interaction with CHDL in the

following ways:

- Develop increased personal pride in country, region, neighbors, as represented in CHDL
- Learn new information about cultural heritage
- Participate and collaborate in the interpretation of these documents

Measuring the degree to which use of the CHDL will affect non-literate people is

difficult. Benefits would be expected to follow CHDL use and would appear only over

the long term.

These benefits can only be realized if the online CHDL database offers an

appropriate cultural usability and systems aspects. "Nonetheless, we require interface

innovation to drive access to ICT-based information, services, and jobs in the fields of

audiovisual interfaces and to create interfaces for all local languages" (Heeks, 2008, p.

28). The study of cultural usability and systems aspects will constitute a first formal step

in that direction for access to cultural heritage material for non-literate citizens in the

developing world.

Chapter 2

Review of the Literature

2.1. Introduction

The research questions described in Chapter 1 can be investigated through interdisciplinary research. Literature in many fields contributes to our understanding of the questions and can provide input into the creation of creative and well adapted solutions. Much of the literature described in this chapter comes from the fields of social science and anthropology and the field of design as it pertains to human-computer interaction. All of the literature examined in this chapter is viewed from the perspective of library and information science.

2.2. Definition of Key Concepts

Given the interdisciplinary nature of this investigation, it is necessary to establish operational definitions for important concepts. Cultural heritage, digital libraries, and culture will be explored and working definitions will be adopted.

2.2.1. Literacy

Literacy is defined as "the quality or state of being literate; knowledge of letters; condition in respect to education, especially the ability to read and write" (Literacy, 1989). The United Nations Educational, Scientific and Cultural Organization (UNESCO) acknowledges that the notion of literacy does not have to be confined to the acts of reading and writing. In a revised and broadened definition, UNESCO states that "literacy is a process of learning that enables individuals to achieve personal goals, develop their knowledge and potential, and participate fully in the community and wider society" (Global Monitoring Report Team EFA, 2008, p. 410). UNESCO estimates that world

adult literacy rates have risen to 84 percent in 2000-2006. Yet 776 million adults in the world today remain without basic literacy skills (p. 91). An illiterate person is one "who cannot read and write with understanding a simple statement related to his/her everyday life." (Global Monitoring Report Team EFA, 2008, p. 411). Illiterate citizens are those who have had opportunities to be educated but who do not know how to read; anyone residing in developed countries of the West (developed North American and European nations) and who cannot read would be considered illiterate. Reasons for illiteracy may be poor education, mental or physical disabilities, or forgetting the skill due to lack of practice. Conversely, non-literate citizens are those coming from oral cultures that do not emphasize literacy or education (Cédelle, 2008). The *Oxford English Dictionary Online* (1989) describes this term as being chiefly anthropological. Illiterate and non-literate people are not the same; however, the two terms may be incorrectly used interchangeably (Cédelle, 2008).

Differing kinds of literacies can be taken into account when describing the non-literate. Both task-literacy and computer literacy can be relevant kinds of literacies that non-literate citizens may develop (Chipchase, 2005, ¶ 3). Non-literate people have not had the opportunity to receive an education; not being able to read is not a reflection on an individual's or a group's intelligence (Chipchase, 2008). To compensate when there is a need for reading or writing, a common strategy for the non-literate is to find someone who can assist.[2] Non-literate citizens in the developing world develop non-reading-based literacies that assist them with their everyday lives and help them flourish within their culture. Because speech is a basic method of communication exploited by people in oral

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[2] Chipchase calls this *proximate literacy* (2005, General Observations ¶ 2).

cultures (Brady, Dyson, & Asela, 2008), there may not be an opportunity, nor a reason, to learn to read.

2.2.2. Culture

Culture will have different meanings depending on the point of view of the researcher. To facilitate this research in the social sciences, definitions of culture put forth by social scientists that have been used by those interested in the study of international design will be privileged. Hofstede and Hofstede, social anthropologists, define culture first as "civilization" in the general sense, and in the anthropological sense as "the collective programming of the mind that distinguishes the members of one group or category of people from another" (2005, p. 400). Their anthropological and somewhat computer-compatible definition echoes in newer terms the definition given by social scientist and anthropologist Hall: "the way of life of a people ... the sum of their learned behavior patterns, attitudes, and material things" (Hall, 1981, p. 20). The work of Hofstede has been used widely in the social sciences outside of his immediate field of anthropology. For this reason, Hofstede and Hofstede's definition is accepted on a preliminary basis, pending further examination from an information and DL point of view.

Studies of usability tend to investigate the attitudes or the capacities of a single user instead of attitudes or beliefs held by members of a certain culture. Hofstede and Hofstede put forth a model of culture that looks like a pyramid (Hoft, 1996, p. 46), where an individual's personality is at the top of the pyramid, his or her culture immediately below, and universal human nature under culture as the base (see Figure 2-1). When Hofstede first published this model in 1980, his simplified version of the pyramid used the terms "individual", "collective", and "universal" to label the three layers (p. 16). The

labeling differences do not interfere, and the model assists in the understanding of culture and its relationship to personality and human nature or to the DNA that is part of the makeup of human beings.

Three Levels of Uniqueness in Mental Programming
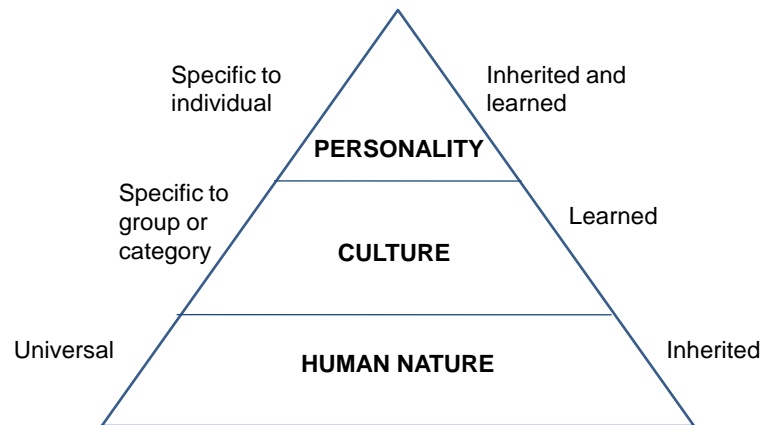
Figure 2-1: Hofstede and Hofstede's (2005) Pyramid Model of Culture.

Studies in the Human-Computer Interaction (HCI) of usability focus on the top layer of the pyramid, the individual user and his or her unique personality (Gould, 2005). Studies in cognition and physical usability address the base of the pyramid, the layer that results from users having human DNA. Relatively little has been done to investigate the middle layer of culture (or "collectivity" as Hofstede (1980) originally described this layer) and its application to the user experience, yet it along with human nature is a foundational part of a user's personality.

In applying discussions of culture to user interface design, HCI researchers have had to adapt definitions of culture to emerging branches of study in their field. In her discussion of culture and interface design, del Galdo (1996) synthesizes definitions of

culture, naming elements such as customary beliefs, social forms, material traits, geographic location, interactions with neighboring countries, internal political warfare, mineral resources, agriculture, nationality, language, history, and level of technical development, in racial, religious, or social groups (1996, p. 78). At the time, she and Nielsen were pioneers in the study of interfaces and culture, and their landmark book was one of the first. The need for explicitness in the definition might have been stronger when the field was in its absolute infancy.

More recent definitions have been more concise. Five years hence, Yeo discusses the localization of software; for him culture is "a group of people, who feel, act, and think similarly" (2001, p. 104). Yeo's study only advocates superficial localization, implying that his understanding of culture is less stringent than necessary for the purposes of the current study of non-literate users. Barber and Badre treat the topics of culture and usability in their paper, and describe culture as a complex notion including "features that distinguish one country or region of the world from another in the electronic medium of the Web" (1998, ¶ 2). In doing so, they avoid giving a definition. In describing the creation and application of cultural models to technology, Hoft defines culture as "learned behavior consisting of thoughts, feelings, and actions" (1996, p. 41). Hoft's definition is simple and inclusive, and created for use in the discussion of international considerations for the creation of interfaces. Hoft advocates a deeper localization for people of different cultures. For these reasons, Hoft's definition of culture has been adopted for this study. The individual elements that del Galdo (1996) highlighted also have relevance to the study of users and to this layer of their mental software or "programming of the mind" (Hofstede, 1980).

2.2.3. Cultural heritage

The United Nations Educational, Scientific and Cultural Organization (UNESCO) describes heritage as "our legacy from the past, what we live with today, and what we pass on to future generations. Our cultural and natural heritage are both irreplaceable sources of life and inspiration" (UNESCO, 2009). Preservation enables us to pass on cultural heritage to future generations while allowing accessing at presents. The preservation of cultural heritage can be facilitated by the use of computers if electronic documents are made. Digital Libraries can serve as repositories for these documents, making them accessible at the present time while safeguarding them for the future. For non-literate people, cultural heritage may be linked to speech through stories, songs, and remembrances. It may also be linked to locations, events, and other markers of identity.

For the purpose of this project, cultural heritage documents that can be accessed by non-literate people are A/V files that do not make use of language, that are unique to a people, and are seen to be a source of information or inspiration worth collecting and maintaining. Many definitions of information exist. Here, information is defined as a message understood by its receiver. The A/V documents that have an interest in terms of cultural heritage will be information-bearing because they will provide a lasting resource for non-literate people to access elements of their own culture heritage. They will also serve as a way for interested outsiders to learn about the cultures.

2.2.4. Digital libraries

There are many definitions of DLs that have been offered, often based on the goal of sponsoring organizations or the focus of individual projects or researcher and participant perspectives. Definitions may focus on the users, the technologies in use, or institutional management, sharing and archiving of documents (Borgman, 2003, pp. 86-

87). Because this project seeks to create a framework for DL interfaces for non-literate

users, focusing on democratic aspects of access to cultural heritage documents, the

approach to DLs used in this research will focus firstly on the user. The definition

proposed in 1996 in the final report of a pioneering workshop on DLs funded by the

National Science Foundation (NSF) and held at the University of California, Los Angeles

(UCLA) will serve as a basis for this study. Because of the present project's focus on the

DL as it pertains to the user, the second part of the workshop's definition is given

priority.

> *2. Digital libraries are constructed -- collected and organized -- by a community of users, and their functional capabilities support the information needs and uses of that community. They are a component of communities in which individuals and groups interact with each other, using data, information, and knowledge resources and systems. In this sense they are an extension, enhancement, and integration of a variety of information institutions as physical places where resources are selected, collected, organized, preserved, and accessed in support of a user community. These information institutions include, among others, libraries, museums, archives, and schools, but digital libraries also extend and serve other community settings, including classrooms, offices, laboratories, homes, and public spaces.* (Borgman et al., 1996, sect. I)

This definition is broad and allows for interpretation in the context of non-literate user

communities or groups in the developing world.

The other part of the UCLA workshop's definition will be retained as a

complementary definition, as this study is also concerned with the possibilities of

organization and retrieval that the system will use to provide users with the access they

require. Technical considerations underlying the design are essential to the end-product

offered to users. This first part of the 1996 workshop's two-part definition specifically

addresses technologies.

> *1. Digital libraries are a set of electronic resources and associated technical capabilities for creating, searching, and using information. In this sense they are*

an extension and enhancement of information storage and retrieval systems that manipulate digital data in any medium (text, images, sounds; static or dynamic images) and exist in distributed networks. The content of digital libraries includes data, metadata that describe various aspects of the data (e.g., representation, creator, owner, reproduction rights), and metadata that consist of links or relationships to other data or metadata, whether internal or external to the digital library (Borgman et al., 1996, sect. I).

The technological or systems aspects of this definition are useful in describing the technologies that users will encounter when accessing the system. Institutional-centered elements such as an interest in federating the search and maintaining the collection over time will be discussed in later chapters as subjects of future study.

Both parts of the working definition consider that users will be accessing the DL to meet specific information needs. In the developing world, *need* is often more strictly defined as physical; *information needs* are secondary to immediate needs for food, shelter, and health care (A. Agunaoun, personal communication, June 17, 2009). Since DLs of electronic cultural heritage documents cannot meet physical need, it is necessary to establish a definition of DL in the context of cultural heritage for non-literate users who choose to access information for culturally-related reasons instead of information need-based ones. This project is concerned with the creation of an interface to a CHDL, with the goal of providing democratic access to non-literate users in the developing world. With these considerations in mind, the following working definition is proposed:

A Cultural Heritage Digital Library (CHDL) for non-literate users is a collection of non-text based electronic documents of cultural or social interest that have been acquisitioned, analyzed, and made available to a community of users through a localized interface. The interface incorporates user-centered cultural, usability, organizational, and retrieval frameworks in providing access to the documents.

In the case of this project, non-textual cultural heritage documents comprising the CHDL corpus should be democratically available. Documents created by Fulbright grantees

during fieldwork include photographs of respondents, audio recordings of interviews,

photographs of places or events, and videos of and by Moroccans, are typical of the kinds

of documents that researchers in a variety of fields may create.

Three formats for non-textual documents that will be immediately accessible by

nonliterary users will comprise the collection. The formats are the following: images,

audio files, and video. Documents in these formats do not need to be read to be

understood, and can be meaningful to groups of people at the national level.

2.3. Cultural Usability Frameworks for DL Creation

There have already been calls to consider culture and usability jointly when

studying Web interfaces on a global scale. Nielsen first edited a monograph on the

subject of international design in 1990, and then co-edited one with del Galdo again in

1996. Barber and Badre (1998) advanced the idea of "culturability," a blending of culture

and usability in the study of Web design.

2.3.1. Applicability of Hofstede's cultural dimensions

Hofstede published a framework for describing and comparing national cultures

based on four dimensions in 1980. This framework is the result of an analysis of paper

surveys of IBM employees in over forty countries in the 1960s and 1970s and interviews

by Hofstede in the 1970s. Based on the values represented in the data, Hofstede

developed four dimensions that each carried a score, providing the ability to rank each

country on each dimension. Values are "an attribute of individuals as well as of

collectivities; culture presupposes a collectivity" (Hofstede, 1980, p. 19). Values are also

"among the building blocks of culture" (Hofstede, 1980, p. 25). Values are taught at an

early age and reinforced through the culture; this is the mechanism that keeps culture

from changing rapidly in the face of changes from outside influences. Later in the 1980s,

Hofstede added a fifth dimension based on personality tests that had been developed for China (Hofstede & Hofstede, 2005). The study of cultural dimensions began by focusing on differences in values between and among nations in terms of business culture, but has been expanded to describe a citizen's views toward family, the State, and education.

National culture is the programming that influences a person's thinking and feeling (Hofstede & Hofstede, 2005); studying national culture is of interest in the social sciences. Reviews of the literature analyzing Hofstede's contribution confirm that his cultural dimensions have been the basis of many studies of national cultures and their technologies[3]. Hofstede's cultural dimensions also have been applied in research focusing on use and usability in different national cultures, and have been used as a framework in research on technologies in diverse and developing countries (c.f. De Angeli, Athavankar, Joshi, Coventry & Johnson, 2004; Yeo, 2001). Cultural dimensions quantifiably identify differences in values between countries, and give insight into the differences in the five dimensions between developed and developing countries.

2.3.1.1. Cultural dimensions

Each of Hofstede's five cultural dimensions gives insight into the nature of the dominant culture in a country. The five cultural dimensions, Power Distance, Uncertainty Avoidance, Individualism, Masculinity, and Orientation, and their descriptions are given in the table below (Table 2-1). For example, the United States has a weak Uncertainty Avoidance, and society in the United States demonstrates characteristics of a successful democracy such as tolerance of individual differences and the acceptance of protests

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[3] *Social sciences*: 18 percent of conference papers at the Cultural Attitudes towards Technology and Communication (CATaC) conference from 1998-2006 cited Hofstede. (Macfadyen, 2008, p. 571). *Information systems*: "Among the national culture studies of IT [51 articles], over 60 percent utilized one or more of Hofstede's dimensions" (Leidner & Kayworth, 2006, p. 363).

(Hofstede & Hofstede, 2005, p. 169, 194). There is a tolerance for uncertainty that

encourages individualism. The United States is the highest ranking country in the

Individualism Index (Hofstede & Hofstede, 2005, p. 78), meaning that the use of the first

person personal pronoun *I* is encouraged; it also can be noted that citizens are more likely

to live in detached houses than in apartments (Hofstede & Hofstede, 2005, p. 95, 97). The

United States is a masculine country, meaning that gender roles are different for men and

women, and competition is encouraged in education (Hofstede & Hofstede, 2005, p 121,

142). Not all Western countries share the same values and they will not have identical

dimensions. There is no way to calculate a country's scores post hoc; instead, scores must

be searched in Hofstede's tables.

Table 2-1: Hofstede's Cultural Dimensions (2005, p. 46, 76, 167, 210).

CULTURAL DIMENSION	DESCRIPTION
Power Distance Index (PDI)	The extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally
Individualism Index (IDV)	Individualism: societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family. Collectivism: societies in which people from birth onward are integrated into strong, cohesive in-groups, which throughout people's lifetimes continue to protect them in exchange for unquestioning loyalty.
Masculinity Index (MAS)	Masculine: when emotional gender roles are clearly distinct: men are supposed to be assertive, tough, and focused on material success, whereas women are supposed to be more modest, tender, and concerned with the quality of life. Feminine: when emotional gender roles overlap: both men and women are supposed to be modest, tender, and concerned with the quality of life.
Uncertainty Avoidance Index (UQI)	The extent to which the members of a culture feel threatened by ambiguous or unknown situations; tolerance
Long-Term Orientation Index (LTO)	Long-term orientation: the fostering of virtues oriented toward future rewards – in particular, perseverance and thrift. Short-term orientation: the fostering of virtues related to the past and present – in particular, respect for tradition, preservation of "face," and fulfilling social obligations.

2.3.1.3. Limitations

Hofstede's framework is well-known in the social sciences; although the

dimensions are not absolute, they fill a void by providing a framework for comparative

study of cultures. The application of these cultural dimensions outside of the realm of

business is questionable, and the use of these dimensions to inform the design of

technology is even less sure. Even within the narrow field for which they were created, it is questionable whether these dimensions are accurate. For Hofstede, each country or area has only one dominant culture (Marcus & Gould, 2000). In the developing world where the educated form an elite, the culture of the elite will have strong ties to former colonizers who introduced Western-style education. Indigenous elements of the culture may remain unknown and unstudied as a result. The IBM surveys Hofstede studied had a Western bias; these surveys and interviews were conducted in English and surveyed highly skilled workers who may not have been representative of their national cultures (Gould, 2005, p. 92). Although the cultural dimensions have limitations, they remain one of the most used methods of comparing cultures internationally and "hold up surprisingly well" (Gould, 2005, p. 93). In their 2004 article on culture and localization in the LIS field, Cyr and Trevor-Smith explore Hofstede's work in culture and its application in the study of design in their review of the literature. This implies that despite the limitations to his methods, Hofstede's framework is a valid way to approach the study of Web design from an LIS perspective.

2.3.2. Applicability of the universal usability framework

Universal Usability applies the notion of usability in a democratic manner to all people and societies. Tenets of usability include the notion of "learnability, efficiency, and satisfaction" and a tenet of HCI includes "detailed audience analysis"; the two take on a more complex meaning when applied to a global context (Barber & Badre, 1998, Introduction). The idea of *use* can be added to the question of usability in this context. Shneiderman described Universal Usability in 2000 "as having more than 90% of all households as successful users of information and communications services at least once a week" (p. 85). The realization of this goal seems a distant dream for many of the

world's poorest citizens. The use of these services would be in spite of inherent problems

of access that include illiteracy and inadequate technological infrastructure.

      Shneiderman (2002) authored a monograph exploring concepts of universal

usability as a democratic, citizen-based movement. He perceives the four stages of human

activities as 1) collect 2) relate 3) create 4) donate (see Figure 2-2). These activities are

not necessarily tied to the use of technology. Hofstede (1980) incorporates this model by

asking readers to fill out a questionnaire and to send the responses to him. Citizens in

developing countries carry out these activities through traditional methods with few

problems on a daily basis. The technology that computers provide allows users to engage

in these activities over greater distances, over time, and for diverse purposes. To engage

in these human activities through the use of the Internet, certain barriers to access must be

met.
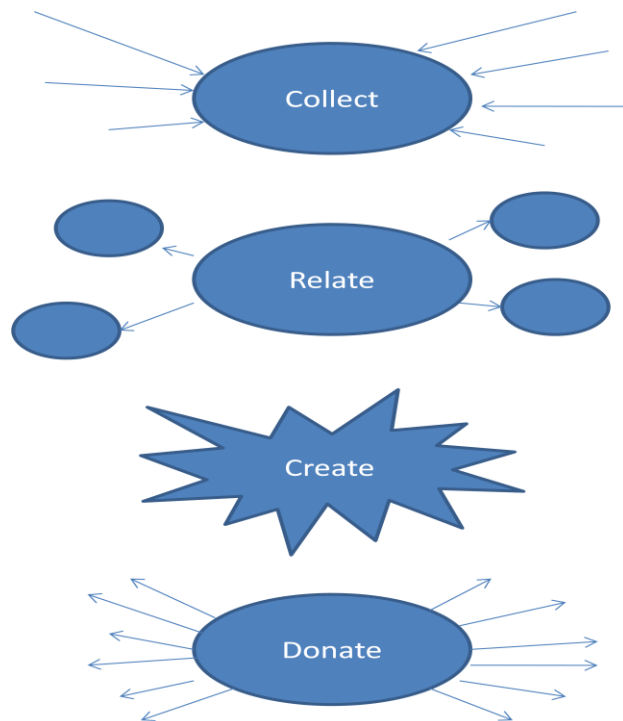
Figure 2-2: Shneiderman's (2002, p. 85) Four Stages of Human Activity.

2.3.2.1 Universal access

Access to information as "the freedom […] to seek, receive and impart information and ideas through any media and regardless of frontiers" is a basic human right (United Nations, 1948/2009, Art.19). The concept of universal access was first put forth in the 1934 U.S. Telecommunications Act (Shneiderman, 2000). The Act aimed to provide "new technologies and services to the public" (p. 17) in a way that was democratic and egalitarian. From its inception, universal access has relied on technology for the transfer of information. Citizens in developing countries have an equal right to access information, but are limited in their use of information technologies by barriers that are linguistic, social, and material. In policy documents, "any media" of the human rights declaration has often been interpreted as telecommunications, the success of which was too simplistically measured by penetration per capita (Klimaszewski & Nyce, 2009).

Users in the developing world may be unable to access online information for a number of reasons. The colonial heritage may be inhibiting spontaneous access to relevant information if average users do not understand the colonizer's language and metaphors. Hall's (1980) revised definition of *culture as communication* is particularly relevant when considering the problem of communication in the developing world. Technical difficulties may also inhibit access. Countries may not have in place necessary infrastructures for access, users may have difficulty acquiring and maintaining hardware and software, and they may be lacking in basic skills and education required for effective online access.

> *Today, it could appear that it is not as important to be knowledgeable as much as to know how to access knowledge — knowing the sources, the navigation processes, the keys to information databases, mastering the techniques and not*

necessarily the content. Information is power and those who have access to information have access to power; that is so true, that in the democratic process, the old saying remains that a non-informed person is a subject, whereas an informed person is a citizen (Richer, 1996, p. 290).

The Internet is also an information technology or "medium" of communication that can be used to provide universal access in the developing world. As developing countries make advances in infrastructure necessary for universal access, more citizens will be able to get online to use the Internet. More citizens will have a reason to access the Internet if there are resources available designed for users with different levels and types of literacies. It is possible to display some of the barriers to access for citizens in developing countries in the figure below.

Factors Affecting User's Situation

- Age
- Gender
- Innate abilities

Influence →

Factors Affecting Access

- In-group status
- Education
- Profession
- Social standing/accept-ability of using tech.

- Thoughts
- Feelings
- Actions
- Values

Influence →

- Innovation
- Publishing and diffusing info.
- Adequate computers
- Technology infrastructure
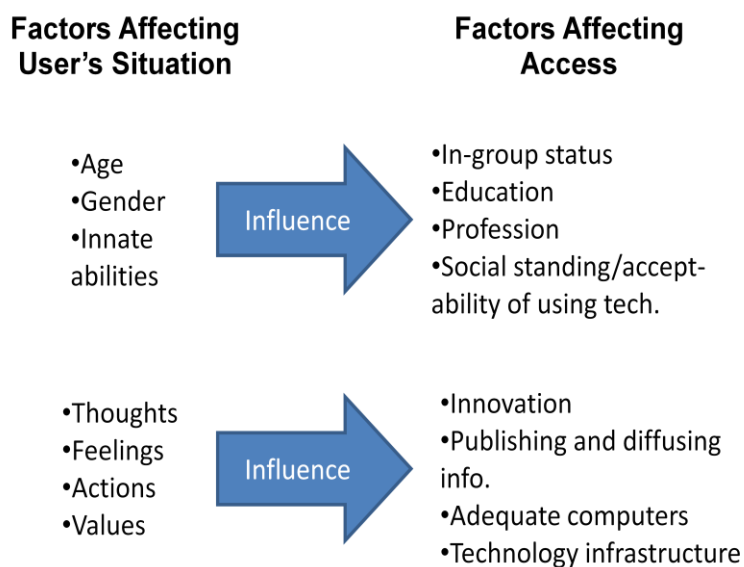
Figure 2-3: Some Factors That May Become Barriers in Developing Countries.

2.3.2.2 Democratic access to information

Universal Usability emphasizes the ideal of democratic access to online information. The US Communications Act of 1934 embodied this ideal, stating,

> *It shall be unlawful for any common carrier to make any unjust or unreasonable discrimination in charges, practices, classifications, regulations, facilities, or services for or in connection with like communication service, directly or indirectly, by any means or device, or to make or give any undue or unreasonable preference or advantage to any particular person, class of persons, or locality, or to subject any particular person, class of persons, or locality to any undue or unreasonable prejudice or disadvantage (US Communications Act, 1934, p. 36).*

Universal usability is an area that can take into account users who are financially and educationally disadvantaged (Shneiderman, 2003, p. 2). In the developing world, situations arise where both users and technologies are limited (Shneiderman, 2003, p. 1)

People with disabilities have the same need to access information as others and also have the same rights to access (Edwards, 1989, p. 46). Disabilities can be physical, cognitive, linguistic, technological, or other. As early as the 1980s, researchers had identified the need to create interfaces specifically for blind users. Using synthetic voice "readers" to pronounce parts of the interface that were designed for sighted users (Edwards, 1989, p. 49) would not suffice. Web design can permit access by a broader range of users through techniques that do not assume visual, auditory, or technological capabilities on the part of the user. Horton's Web design handbook purports to promote universal usability, but actually promotes *universal design*. The book does not address problems of cognitive/educational or linguistic barriers to use.[4] Instead, it promotes "an approach to design that attempts to incorporate features that make things usable by more than just the 'average' person" (Horton, 2006, pp. 8-9)

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[4] Horton, S. (2006). *Access by design: A guide to universal usability for web designers*. Berkeley, CA: New Riders. Horton includes the term "universal usability" in her subtitle; the universe of examples is limited to Anglophone websites, some of which, like Fast Company (p. 212), require a subscription, or like the US branch of UNICEF, are asking for donations (p. 159). There is a strong United States bias in the work, and disabilities linked to literacy and poverty are not considered.

Outside of the United States and other countries with strong traditions in literacy and cultures of reading, there are nations where the average person cannot read. The problem of enabling access to specified content for uneducated user groups in developing countries has not been adequately addressed. User experience literature recognizes that educated or "average" users may have difficulties with use and navigation. "The needs of illiterates are rarely taken into account in the design of computer interfaces – indeed, the field of usability has provided graphic illustrations of how interactions can be made difficult for even highly educated users" (Deo et al., 2004, p. 3). Universal usability recognizes the enormous problem of use and access for those who do not have literacy skills, despite the relative silence on the part of the human-computer interaction literature on the topic (Deo et al., 2004, p. 3).

2.3.2.3 Multicultural approaches

Concepts of global (Yeo, 2001) or multicultural design can be applied to Web design within the framework of universal usability. Multicultural Web resources are resources that are made to be used by members of different cultures simultaneously; they are localized to differing extents in an attempt to meet user need. This research identifies two primary ways to approach multicultural design: 1) a *superficial* approach localization that is mostly concerned with language or other cosmetic elements of an interface and 2) a *deep* approach to localization that seeks to modify the entire structure of the design as opposed to retrofitting. The second multicultural design approach is considerably more expensive to create and more difficult to maintain. Direct and ongoing feedback is needed from users in the culture in the second approach. The first approach is cheaper and easier to manage on many levels. Let us begin by examining the superficial approach to multicultural design.

Language may be a primary manifestation of culture in terms of interface use, but it is not the only one. Translating an interface from one language, usually English, into a target language, will not encourage a robust user experience (Barber & Badre, 1998). In the consideration of superficial multicultural design, the process of localization focuses on elements that are easy to change like language, time zone, date conventions, and currencies. Del Galdo (1990) lists a number of other elements, including alphabetization practice for European languages that use diacritics, time conventions, and non-English character scripts. Where symbols and icons are concerned, she advocates that designers "design the icon or symbol with the entire intended market for the product in mind" (p. 7), and that they test the resulting interface on all users. Some designers may not go as far as del Galdo, and may focus their localization efforts on language. Superficial multicultural approaches to Web design offer a relatively simple solution to the problem of satisfying multiple user groups with one basic interface. One inoffensive design is chosen, and the textual content is superficially localized according to the market.

Undertaking a deep multicultural approach to the problem of localization is a much larger investment in terms of time and energy. Cry and Trevor-Smith, in their quest for design that "appears to have been developed within the local culture," recommend considering the superficial elements we have named as well as more difficult elements to capture, such as "local color sensitivities" and "gender roles" (2004, p. 1199). One example of localization could be found in the online Yahoo! Directory before the page layout changed. The directory in the United States listed movies under "entertainment," since those in the United States, in general, tend to think of movies, television, and sporting events as being in the same category. The French office of Yahoo! chose to list

cinema under "culture" in the French directory since films, to the French, are more like ballet or opera. As of October, 2009, the French directory lists cinema under entertainment in a way that is similar to the version promoted for users in the United States, but the layout is still slightly different and the colors used are modified for the two user groups. Without carrying out usability tests in each country, it is difficult to identify content particular to a certain nation or group in the current online environment, which perhaps is why content, structures, and options will constantly be in a state of flux.

In business, a multicultural approach to a Web presence is logical due to the homogeneity in education, language, professional experience, and social situation of the users and customers. The same is true for software, much of which is created in the United States but sold abroad (Yeo, 2001). Those who have the means to use the Internet for business have acquired a certain education, speak an international language, are business professionals, and have a social situation that meets the infrastructure requirements for access. The concept of a limited or superficial multicultural interface is appealing in the world of business, as one product can be marketed in numerous cultures with minimal or no modifications. In a multicultural national situation such as a developing country in Africa, secondary or tertiary cultures may have no online presence from which to gauge appropriateness of content or basics of design preferences and usability features. It is extremely difficult to create a deep multicultural interface for users who are still discovering their own style and have not had extensive experience using interfaces. Nonetheless, for users who have had little exposure to international cultures or to the Internet, an interface geared to their particular culture is still advisable.

A great deal of literature exists to guide designers and developers of DLs in the creation of user-friendly design for Westerners. Efforts at deep multicultural localization may not be necessary for groups of Western users whose cultures are largely similar. Multicultural designs alleviate redundant design work for interfaces that can be made to serve the needs of diverse groups having compatible national cultures, approaches to usability, and senses of aesthetics. Multicultural design theory opposes the deep localization of interfaces because of the labor-intensive nature of their creation.

For groups of non-literate users, it is argued that deep localization is unavoidable, and that frameworks to good design can facilitate the creation of usable CHDLs and interfaces. The study proposes to examine both the concept of multicultural design for the developing world as a basic or superficial framework (Chapter 5), and to apply that framework in a deeply localized way through the discussion of a prototype for the developing country of Morocco (Chapter 6).

2.3.2.4 Adaptation of the universal usability framework

Working within a Universal Usability framework, the following general user requirements have been adapted from the work by Deo et al. (2004). To promote Universal Usability, the optimum interface design for non-literate citizens of developing countries should incorporate the following recommendations in a way that is appropriate:

- No areas will require the use of text to access documents. A keyboard will not be needed once the DL homepage has been accessed.
- Elements that encourage ease of remembrance and ease of learning should be primary.
- The interface should be simple, easy to use.
- Frustration should be kept to a minimum.

2.3.2.5 Limitations

Universal Usability empowers all citizens, regardless of social situation or geographic location, to access information online. Infrastructures necessary for Internet access such as electricity lines, ISPs and phone or broadband lines, a network of computer sales and repair, software, and governmental endorsement are not yet conducive to access in many parts of the developing world. One extreme example of limitations in the developing world can be found in sub-Saharan Africa, where only 3 percent of villages have a fixed line phone connection (Market Information and Statistics Unit, 2007, p. 2). Rural access to electricity in Sub-Saharan Africa is scarce. Excluding the outlier Nigeria, the rate of household electricity access is five percent (Market Information and Statistics Unit., 2007, p. 4). Intermittent access to the Internet and other information technologies because of infrastructure limitations does not meet the stated goals of Universal Usability. Even limited use of these technologies provides an introduction to computer access that may bear some benefits.

This research approaches problems of universal usability from a national standpoint. Localization is encouraged, but on a national level. Some studies of usability and Information and Communication Technologies (ICTs) have suggested that localization should preferably take place at the local or community level (Klimaszewski & Nyce, 2009). Although the most local of approaches for CHDL implementation is advisable, nations are considered to be the optimum unit for study for the current project. Culture is therefore at the national level, contributions to the CHDL depend on practical matters such as funding. The look of the interface and the structure of the CHDL are expected to be uniform on a national level. It is at the local or community level that the process of evaluation will take place.

2.4. Applicability of Library and Information Science Theory

Library and information science space (LIS) theory is concerned with the

provision of access to information. Saracevic distinguishes between information, a

"*phenomenon*" and communication, a "*process*". (2006, p. 16). In a dynamic sense,

information can be a message that is shared verbally, through writing, or speaking. It can

also be recorded data that is meaningful to someone (Reitz, 2003, sec. I). Information can

be correct, or it can be incorrect as is the case with *misinformation*. At times, the

information can be good and pertinent, but the person receiving the information is not

equipped to comprehend the message. When two people who do not speak the same

language try to communicate verbally, it is possible that the information will not pass

even though the message has been heard; the information or phenomenon behind the

failed conversation remains valid, but the communication process failed.

Relevance is an essential concept in LIS theory. For information to be

meaningful, it must be relevant. Theories of relevance underlie the work done in LIS,

since the phenomenon of information transfer cannot take place if the user of the

information is not equipped, be it for mental, physical, or cultural reasons, to receive the

message that is being transmitted. The focus in modern LIS studies is often on the user of

the information, since his or her objective assessment of relevance must be taken into

account when providing access.

S. R. Ranganathan was one of the first LIS thinkers to consider the formalization

of user-centered directives through the establishment of laws. He established five laws of

library science in his 1931 monograph that bring the attention ultimately to the user. The

laws that he posits are the following: 1) Books are for use. 2) Every person, his or her

book. 3) Every book its reader. 4) Save the time of the reader. 5) The library is a growing organism (Ranganathan, 1931). Ranganathan proposes a library which is meant to be used, which collects materials with users in mind and which seeks to maintain that those materials are discovered. Information professionals are to take the time to organize carefully, as users should be able to access desired materials quickly. The library must change and grow over time, and the collection must evolve continually to meet user need. This dynamic and user-centered approach to collection development and provision of access were meant to inform information professionals working in traditional library environments, but can be applied to modern electronic environments. While Ranganathan chooses the word "book", it is assumed that he could have been indicating any information-bearing item in a library collection. The application of these rules in the digital context has been ongoing (c.f. Cloonan & Dove, 2007). Digital libraries house collections of materials that are acquired and accessioned with the same amount of care as collections of physical objects in brick and mortar institutions. With these "laws" or principles as a guide, the provision of non-textual information in digital formats has the potential to meet the need of non-literate users.

More specific theories of organization of information and information retrieval are applied in the digital library environment, taking advantage of the conveniences that technology affords the user. Namely, the framework underlying the read/write Web has been applied in LIS systems that permit Web access to library resources. The next sections will explore specific elements of LIS theory, user-driven access in the Web environment, and related concepts of interest in the scope of this research into access in the DL environment. Elements of DL creation are always considered with the user in

mind and if possible, from the user's point of view. For the current CHDL project being described, there are inherent limitations in this review of the literature since the theories, models, and frameworks described apply to users and systems in the developed world. This limitation is profound, but it is nonetheless useful to survey the state of the LIS field and the methods of access that may affect users as we have defined them.

2.4.1. Organization of information theory

Theory in organization of information focuses on intellectual access to materials in the collection and is often the subject of international, national, or organizational standards that are refined through practice.[5] Organization of information is the intellectual work describing the content and container of a document that prepares the document for discovery and selection by users. Retrieval systems work if information about the documents, called metadata, is systematically entered in the database. Descriptive elements such as format, language, or date of publication can guide a user to a document that meets his need and is relevant to his situation. Much agreement exists internationally on the use of codes that can represent pertinent information.[6] Methods for recording information such as title of document and publisher are also relatively straightforward; agreement is strong between the cataloging rules for description used in the English speaking world, the Anglo-American Cataloguing Rules, 2nd edition, revised (AACR2r) and the rules from France and the French-speaking world, the Association française de Normalisation (AFNOR). The theory behind subject analysis is similarly straightforward: documents on the same topic are assigned descriptors or subject

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[5] ISO standards, including the Unites States based NISO standards, are examples of international and national standards. The UNIMARC metadata format created and maintained by the International Federation of Library Associations and Institutions (IFLA) is an example of an organizational standard.
[6] Two-letter and three-letter language codes are maintained by ISO.

headings that accurately and specifically describe the intellectual contents of the document. This allows for the collocation of results in the retrieval mechanism. The application of this theory is more challenging due to its practical application by human participants: authors write for an array of readers from a variety of standpoints, information professionals serve as intermediaries and who must interpret the words of the authors and translate them to terms that users, even uninitiated ones, will use when searching for the document, and the users themselves must formalize their own questions, construct the query, evaluate the results, and in many cases, navigate an interface to get to relevant documents. Directives are given, but the results are not always flawless.

Organization of information theory posits the application of controlled vocabularies that can facilitate the user's task; these are the mechanisms that are used in the IR systems offered in libraries. Terms can be selected to describe the *aboutness* of a document. Hierarchical organization of terms allows the relationships between words and concepts to be made explicit. In choosing a descriptor from the list and typing it the same way that it appears in the subject field of other surrogates, the information intermediary or indexer creates a way to collocate all of the documents with that same descriptor; they will all be returned as results when that descriptor is searched. The indexing term indicates *aboutness* in the way that it must be the anticipated term, and not necessarily the result of understanding the document (Maron, 1977). The principle of specific entry requires that the most specific term from the controlled vocabulary list be used instead of a more general term. Indexers anticipate user searching behavior when selecting their descriptors, a task that despite instructions for application, retains an element of judgment

on the part of the indexer and that can lead to inconsistencies and inaccuracies in the indexing.

2.4.2. Information retrieval theory

Information Retrieval (IR) models explore the ways in which systems can be made more responsive to user need and assist in the understanding of users at the retrieval stage of information seeking. Working from collections of documents that have undergone human or machine-organization, IR systems propose lists of responses to user queries that are relevant, pertinent (precision), and comprehensive (recall). Although work has been done with the use of full-text to aid in organization and retrieval, that research is out of the scope of the study being described and therefore will not be treated in this review of the literature. This study prefers to focus on research that may be adapted directly to the needs of non-literate users, or that informs the creation of systems aspects for such users. Robust LIS models of IR complement and complete theories and practice of organization of information described in the previous section, and provide valuable insight into how information may be made accessible to users.

Evaluation is essential in IR, and provides insight into the ways that systems and users operate. The Cranfield experiments were among the first experiments in IR and served as the foundation to the understanding of IR systems during the 1960s. Cleverdon's approach emphasized computing power and formal evaluation of indexing systems. A 2 x 2 contingency table is a standard method used to show the results of a normal search, where a certain number of documents are relevant or not, and a certain number are retrieved or not (precision v. recall) in what is now perceived as a very holistic approach to evaluation (Cleverdon, 1997).

After the Turn in IR, the LIS community witnessed a paradigm shift that placed the focus of research on the cognitive state of users and developed a more user-centered approach to evaluation in the 1980s. By the early 1990s, Robertson and Hancock-Beaulieu (1992) describe the sea change since this early 1960s holistic approach to system evaluation. Broad-reaching looks at systems are no longer the main focal point for research as IR study moves to embrace the user-centered approach.

Tests of systems that considered users have shaped the understanding and evaluation of systems and have helped contribute to the foundation of new approaches and advances in IR. The Text Retrieval Conferences (TREC) workshops, sponsored by the United States National Institute of Standards and Technology and begun in 1992, provided insights into evaluation and system improvements in IR, and proceedings are available from the yearly workshops back to the advent of the project (TREC Proceedings, 2009). A variety of *tracks* exist or have existed, proposing experiments with Web retrieval, cross-language retrieval, and video segmentation and automatic indexing and retrieval.[7] Experiments are run by researchers in the tracks that are offered that year. Findings of the TREC experiments include the notions that combinations of words are less ambiguous than words alone and that false drops may be reduced in modern information systems (Browne & Jermey, 2007). The TREC studies continue to be held up as a good way of studying a benchmark set of documents (Baeza-Yates & Ribiero-Neto, 1999). Tracks studied in TREC workshops have been varied, but none have focused specifically on retrieval for non-literate or disadvantaged user groups.

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[7] More information about the TREC tracks appears: http://trec.nist.gov/tracks.html (retrieved October 6, 2009)

Bates focused on users instead of on system evaluation and proposed a berrypicking model of end-user searching in the modern search environment (Bates, 1989). The berrypicking model opposes the linear search model that had been assumed in early tests of IR systems. In the berrypicking model, the user's information need changes and evolves throughout the search, and the search strategy will shift accordingly (see Figure 2-4). Flexible models for database exploration such as browsing are of interest to the current study, as non-literate users will not be expected to launch a variety of text-based searches, but may experience their searches evolving as they interact with the system. Users may browse through the CHDL, "exploring" the space as they look for interesting documents. The goal of the exploration is less clear in the mind of the browser than in the mind of the searcher (Baeza-Yates &Ribeiro-Neto, 1999), and any systems proposed for non-literate users should take advantage of this.
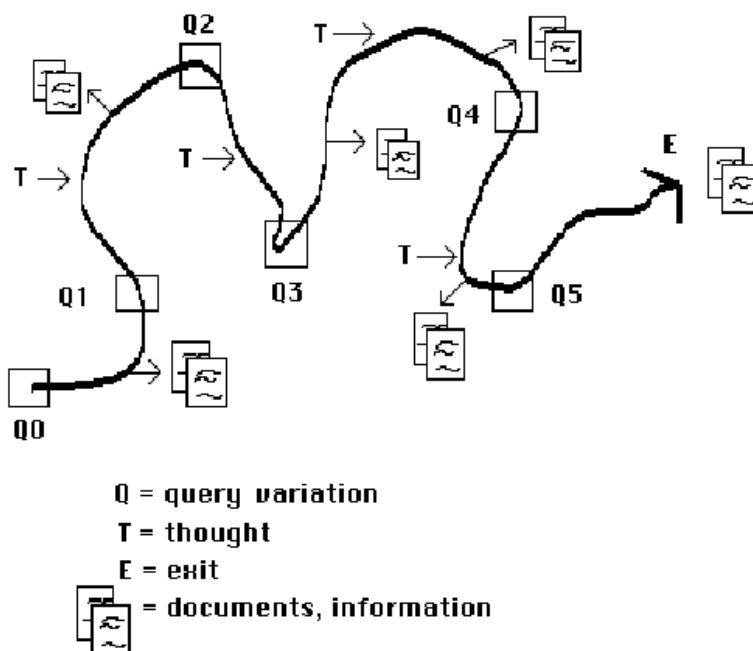
Figure 2-4: Bates's (1989) Berrypicking Model.

Browsing will be further investigated, since retrieval often focuses on matches with query terms. In their chapter on modeling, Baeza-Yates and Ribeiro-Neto (1999) describe three kinds of browsing: flat, structure guided, and hypertext. There are two kinds of flat browsing, one within the document space and one within the document itself. Although the first kind of flat browsing, which assists with relevancy feedback since like documents can be exploited in the quest for additional keywords, it is the second kind of flat browsing that is most interesting in the CHDL context. Being able to move easily within a single document, especially when it is A/V, facilities exploration by the user. The guided structure model of browsing proposes selections based on a directory. After choosing a directory, users are presented with a list of all documents in that category. Underlying metadata that is the product of intellectual and physical analysis of the document will permit such categories to be created. Instead of providing access through directory terms, access could be provided when users click icons. The final model presented, the hypertext model of browsing, could be used to augment and refine the single-document flat browsing described above if the metadata, including potentially user-created metadata, permitted the markup and indexing of individual segments of documents.

Accommodations for flexible models of exploration can be seen in the searching/browsing model adopted by Web-based social media sites such as the video-sharing site owned by Google called YouTube. On YouTube, metadata is primarily limited to what authors provide. Users are presented with suggested popular resources upon entry to the site, and are suggested follow-up resources after having identified a video to watch. YouTube's emphasis on browsing allows users to exploit their tendency

to change paths once the consultation of documents has begun. Finding a set of documents to be relevant may be a shared characteristic among group members who share a similar demographic, set of interests, or other commonality. Personalized suggestions based on what a user has watched attempt to insure relevancy based on the profile for the user and the content of the document viewed. The star rating system, once learned, is an image-driven method of communicating quickly to users the opinions of others.

2.4.3. Access to information and the read/write Web

The read-write Web embodies ideals of democratic access to information, of the people, by the people, and for the people. Command line searching was difficult and information professionals had to work as intermediaries in searches. During the 1990s, as the Turn in IR was being solidified in the systems, the Web appeared as a means of information transfer and Graphical User Interfaces (GUIs) became increasingly popular. A degree of difficulty remained in the creation and diffusion of content; difficulty with creating content was gradually alleviated by increasingly user-friendly software. Blogs were among the first social networking sites, allowing users to create content, share it, and comment, thereby creating the blogosphere. Research in online social media studies users and democratic resources like blogs, social tagging sites, social networking sites, and other collaborative spaces where content is created, shared, and commented on as it is personalized. Read-write Web content can be studied using the lens of traditional LIS theory and findings can contribute to the design of Web-based retrieval systems such as the CHDL I propose.

2.4.3.1. Organization of information and Web users

The extension of theories such as the choice and application of index terms can be examined in the Web environment through the study of social tagging. Guy and Tonkin describe tags as "any word that defines a relationship between the online resource and a concept in the user's mind" (2006). When referring to the delicious.com social bookmarking site, Golder and Huberman note the inherent inconsistency of having personalized bookmarks in an open, online environment. "These two features – storage of personal bookmarks and the public nature of those bookmarks – are somewhat at odds with one another" (2006, p. 201). Tagging can be seen as an attempt to personalize the Web while contributing valuable time and energy resources to the collective good (Anderson, 2006). Although individual tags are not part of a controlled vocabulary, when they are viewed in the aggregate trends can be studied. In her chapter on tagging, Kroski asserts that tag clouds are a glimpse into the "Zeitgeist, or what is currently in the public favor" as well as, in certain systems, tags for a particular user (2007, p. 94). The way tags are used may also be changing over time. Russell notes that, in the past, users supplied plural common nouns that were similar to indexing terms. More recently, users have been supplying singular nouns that seem to function more as labels than indexing terms (Russell, 2008). Social tags can be considered to be wild forces that do not require taming (Walker, 2005) because these tags can function as a way of establishing order in the Web 2.0 environment (Shirky, 2005). When a critical mass of community-generated tags is reached, users from within that community are able to navigate a set of intuitive tags to find meaningful and relevant resources. Kipp also carries out a study of tags that are available on publicly available social tagging sites, but in doing so, keeps in mind the different roles of the traditional indexer (professional intermediary) and the user/tagger.

In her 2007 article, Kipp takes user tags from CiteULike as well as author keywords and descriptors (MESH terms) from PubMed for scholarly articles in the field of biology. In this way, Kipp's research was similar to the Lin et al. (2006) case study using Connotea terms and MESH terms along with automatically generated terms. Kipp concludes that users prefer to follow associative trails rather than to search using controlled vocabulary terms.

2.4.3.2. Information retrieval and Web users

Web search engines in general and the Google search engine in particular allow literate users to carry out their own Web searches with ease. Whereas traditional IR systems base evaluation on measures of recall and precision, the Google-led search engine environment focuses evaluation on user failure and success. The abundance of documents on the Web makes finding all relevant documents unnecessary for the average Web user, alleviating the need for perfect recall. According to Larry Page, measures of recall are not used for evaluation in the Google search engine (Diakoff, 2004, quoted in Browne & Jermey, 2007, p. 73.). Instead, the PageRank algorithm promotes the discovery of relevant documents that are authoritative and accurate. This is not far removed from the direction in which mainstream LIS was moving in the late 1990s, when Baeza-Yates and Ribiero-Neto declared that time and space are the most important measures of effectiveness in IR system evaluation. To them, though, recall and precision still play a vital part. User-oriented results focus on things like coverage and novelty ratios (Baeza-Yates & Ribiero-Neto, 1999).

Google also promotes web search by format, offering a search of web images and a video in the product YouTube that it acquired in 2006 ("Google buys YouTube", 2006). The non text-based organization and retrieval of images and video makes products such

as an image search and YouTube of particular interest to this project. Technology such as cookies and the safeguarding of search histories permits the customization of results. Personalization of searching experience can provide more relevant results to users.

2.4.3.3. New directions for Web users

Perhaps the greatest departure from traditional LIS organization of information and information retrieval models is the new participatory model embodied by the read-write Web. User contributions in the form of social tags were discussed earlier. Other forms, such as the creation of text, video, and other content, the posting of that content in a forum that makes it discoverable by other Internet users who may also comment it, and the evaluation of the content of others all are part of the read-write Web and the democratization of online content. Participation on the part of users is direct: users annotate with social tags neither as author nor intermediary but as user of the information. In creating, adding and commenting on Web content, users are personalizing their own Web experiences and sharing those experiences with others in their group. The model embodied in the read-write Web corresponds exactly to the model of human activities that Shneiderman put forth in 2002, just as the read-write Web was getting underway (refer back to Figure 2-2). The importance of the group and the community will be reexamined later in the discussion of citizens in developing countries and their cultural practices.

2.5. New Technology in the Developing World

In an attempt to understand the technology infrastructure in the developing world and as a way of gaining insight into the adoption and use of new technologies, it is important to look specifically at ICT adoption, and to technology transfer in general. Kedia and Bhagat (1988) propose a conceptual model of technology transfer moving

from the developed West to developing countries in the world of business. They see

technology transfer as a process where the "transfer of a systematically developed set of

organized information, skills, rights, and services" takes place (p. 561); to them,

technology is not tied to new media or electronic devices but to purposeful novelty in

"products, processes, and people" (p. 562). In the model they put forth (see Figure 2-5

below), Kedia and Bhagat (1988) suggest that the original four of Hofstede's cultural

dimensions can be moderating influences on successful technology transfer between

cultures; neither culture is superior compared to the other. The other noteworthy

moderating influence they include is the absorptive capacity of the recipient organization.

Ethnographic research in modern Eastern Europe (what was considered to be the Second

World during the communist era) asserts that attempts at the adoption of an information

society through the use of new technologies in rural and underprivileged areas have not

succeeded (Klimaszewski & Nyce, 2009). Hill, Loch, Straub, and El-Sheshai, (1998)

propose that the Western bias of the creators of technology works to exclude those in

Arab cultures.
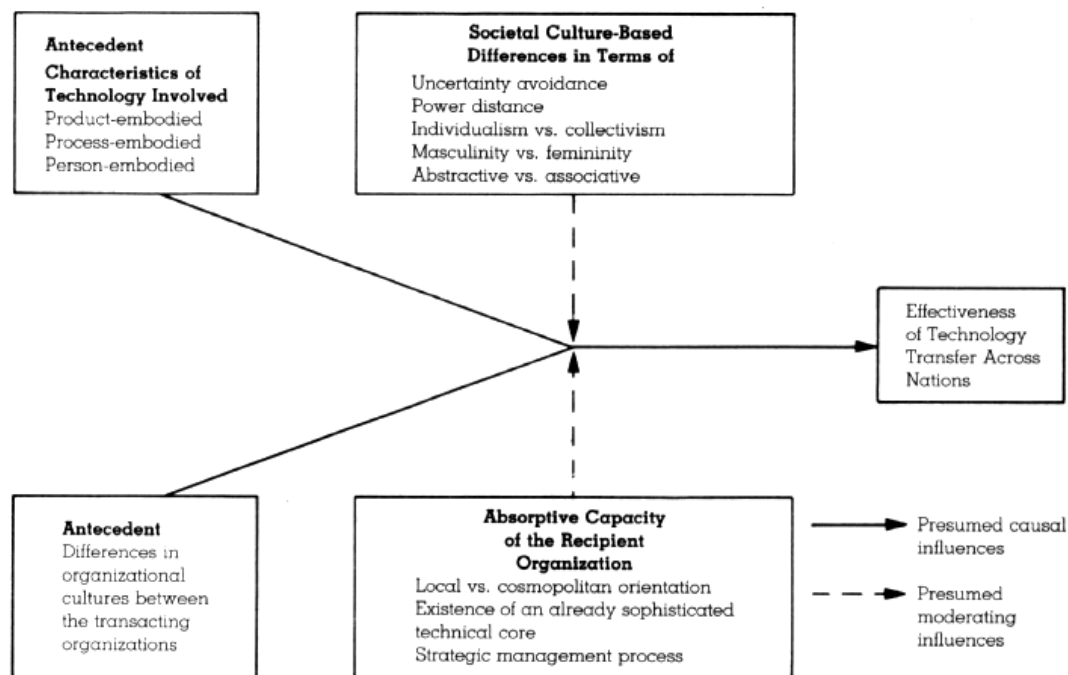
Figure 2-5: Kedia and Bhagat (1988)'s Conceptual model for understanding cultural constraints on technology transfers.

2.5.1. Information and Communication Technologies (ICTs)

Information technology is increasingly an essential part of modern life in the developing world; use of new technologies, especially communication-based ones, is on the rise in developing countries in Africa. North African countries in particular are experiencing growth in ICT penetration.

Information communication technologies (ICTs) are changing the way people communicate in developing countries. Africa has shown the highest increase in the number of mobile phone subscribers in the world. Infrastructure necessary for mobile telephone connections is in place in 45 percent of villages in Sub-Saharan Africa (Market Information and Statistics Unit, 2007, p. 2). Telephone conversations maintain a personal feel even though carried out through the use of a telephone device; telephone

conversations do not deprive speakers from traditional cultures of a feeling of personalized contact (Goodman & Green, 1992). Mobile phones are able to penetrate in Africa and other developing areas because they are communication tools that permit the continuation of the standard form of communication: speech. The devices are robust enough to withstand a difficult climate, and the interfaces are easy enough for non-literate and semi-literate users to manipulate (Brady, Dyson, & Asela, 2008).

2.5.2. Computer icons as metaphors

The *Oxford English Dictionary* defines metaphors as "something regarded as representative or suggestive of something else, esp. as a material emblem of an abstract quality, condition, notion, etc.; a symbol, a token" (2009). Computing metaphors help users understand the computing experience by relating abstract computing processes to something more concrete. Computing metaphors can be represented as images, sounds, or through other methods (Marcus, 2005, p. 52). Computer icons are examples of metaphors, as they inherently stand for something else (Shirk & Smith, 1994). The use of icons has not been standardized across computer systems, nor internationally. Icons have been used successfully internationally in traffic symbols (Kacmar & Carey, 1991, p. 443; see Figure 2-6 for an example). Drivers who cannot read may be licensed in Morocco; to learn the rules of the road, they study audio driving manuals (Storekeeper in Rabat, Personal communication, June 2008). It is reasonable to imagine that non-literate computer users will be able to master a digital library interface with reasonable accuracy if the design of the system is intuitive. In computer interfaces, icons are one of the most difficult elements to design (Knight, Gunawardena, Barberà & Aydin, 2008); the question of layers of culture makes the task of the designer even more difficult. Although the icons of the DL interface may not be identical to ones in other online searching environments,

the best, most usable icons should be chosen since there is no established international standard to which designers must adhere.

Figure 2-6: Stop signs A) in Arabic in Rabat (Morocco)[8], in French in Quebec (Canada)[9], in Cree in Chisasibi (Quebec, Canada)[10], and in Chinese (China).[11]

2.5.3. Case study: The eFez project in Morocco

Researchers at the Al Akhawayn University in Ifrane, Morocco, in conjunction with students and Canadian experts, set out to create an eGovernment project to benefit Moroccan citizens of the city of Fez. The project, called the Fez eGoverment Project (eFez Project), would take advantage of ICTs and would offer access to scanned birth certificates for literate and non-literate citizens. Electronic access to birth certificates was made available through special touch-screen kiosks that offered instructions in a variety of spoken languages. The initial two-year project was funded by the Canadian International Development Research Centre (IDRC), and work was completed in 2006 (Moulin, Kettani, & Elmahdi, n.d.). The project has currently been taken over by a start-up (K. Smith, personal communication, June 22, 2009).

Evaluation of the project was carried out through a survey of users in late spring, 2006. Of the 500 citizens surveyed, just over 14 percent of the interviewees had no

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[8] In front of the Hilton. Photo by Eric Childress.
[9] http://photoclub.canadiangeographic.ca/photos/cgpc_quebec/picture164442.aspx
[10] http://www.advrider.com/forums/showthread.php?t=182457&page=7
[11] http://www.flickr.com/photos/gajbatton/2985482195/

education or only had a primary school education. Of the respondents, 95 percent had

used the kiosk: 91.2% of respondents were *very satisfied*; 93% respondents rated the

service delivery as *excellent* (Moulin, Kettani, & Elmahdi, n.d.). The method used for

conducting the surveys is unclear. Based on the Long-Term Orientation of Arab countries

and African countries, it is assumed that the results reported are elevated compared to the

reality of the experience for users. To save face, it may be imagined that respondents

reported having used the interface. To help the researchers save face, respondents

continued to report that the service delivery was excellent. In a society where saving face

is important, it is difficult to imagine that a respondent would not have been "mentally

programmed" to reply by giving responses that would please the questioner; other studies

report this phenomenon (Deo et al., 2004). Conjecture concerning the overwhelmingly

positive results was not discussed as limitations of the eFez Project's evaluation,

indicating perhaps the values of the researchers and the type of evaluation that were

carried out before the release of the project.

The eFez Project had goals that align with ICT for Development (ICT4D) 1.0,

where the poor of the developing world are invited to use e-resources (Heeks, 2008).

However, the URL for online access to the project is no longer working, and there are no

surviving pages in the Internet Archive's *Way Back Machine* since 2007. It cannot be

established whether the kiosk and the interface are still in use in the BEC office in Fez or

if and how non-literate users are using it.

2.5.3.1. Failure of new technology integration

The eFez Project considers itself to be a success. Not all instances of integration

of new technologies into the Arab world are successful. Hill, Loch, Straub, and El-

Sheshai (1998) explore the reasons for failures.

2.6. Francophone Africa as Developing World

Many countries currently considered "developing" were at one time colonies of European powers. European colonizers left their mark physically in terms of the national boundaries they established in Africa (Hofstede & Hofstede, 2005, p. 18), but also culturally by leaving their language and educational systems. In his book on intercultural communication, Hall (1981) gives a revised definition of culture, equating it directly with communication, and communication with culture. How a group communicates is an essential part of its culture, and the French seem to have understood that notion from the time of their colonies. The term "francophonie" was coined by a French geographer, Onésisme Reclus (1837-1916), in 1880 to mean both the people and countries using French for various purposes (OIF, 2009b, p. 6). After the period of decolonization in the mid-twentieth century, France sought to maintain a sphere of influence not only in former colonies, but in the world. French policies would go on to influence the countries linguistically, and thus culturally, especially the ones in Africa.

In 1960, three statesmen from former French colonies, including the well-known Léopold Sédar Senghor, suggested "grouping the newly independent countries that wanted to pursue relations founded in cultural and linguistic affinities with France" ("Chronologie", 2009, p. 6). The organization they began is known today as the Organisation Internationale de la Francophonie (OIF). The OIF has 56 member countries and 14 observer countries (OIF, 2009c). Since the time of the founding, one of the principal objectives has been the promotion of French as a world language (Dobie, 2003, p. 33). According to the 2005 charter for the name change, the OIF sees the people of the *francophonie* as "multiple and diverse" but recognizes the need for French as a means of

accessing modernity and as a tool for communication to promote exchange (OIF, 2009a). According to the Charter, French should be the language of information *par excellence* in the former colonies. The use of the French language in former colonies can be considered as an extension of French universalism (Dobie, 2003, p. 33). The practical aspects of a common language to unite otherwise disparate and often developing peoples are undeniable. The Agence de la Francophonie (ACCT), another group that sponsors a biannual Francophone Summit (La Conférence des chefs d'Etat et de Gouvernement ayant le français en partage) was encouraging member countries to focus on francophone material and the various national productions. This is achieved while respecting the national languages of each Francophone Member State" (Richer, 1996, p. 297). It may be preferable to be part of the global conversation in the language of the former colonizer than to be left behind in linguistic isolation. A large percentage of the concerned countries, especially ones considered to be developing and that have the status of former French colonies, are on or associated with the African continent.

One test of the success of the OIF's charter is to see how African counties identified as *francophonie* are doing in terms of access to information. We will consider that users may access information though one of two infrastructures: the library system as administrated by the national library and Internet access as measured by Web penetration. If these countries are to share information with each other using the *lingua franca* of French, then the 28 continental African countries that are OIF member states need to guarantee modern communication channels for citizens.

The population of *francophonie* Africa is a substantial part of the population of Africa, as 41.2 percent of the continent's population is in a *francophonie* country. Total

population counts for the *francophonie* countries include islands off the eastern coast of

Africa, but do not include the current French protectorate of Réunion. Egypt is a member

of the OIF and although it was not colonized by the French, it chooses to identify with

this group of French-speaking countries. Egypt is therefore included in these statistics.

Algeria is not a member of the OIF and has not been included in the numbers presented

herein even though it was a former French colony and is geographically considered North

African and part of the Maghreb. Algeria does not choose to identify with its French-

language past for the purpose of international recognition as a French-speaking state.

Morocco is a member of *la francophonie* but certainly not all of its people are

Francophone.

2.6.1. Francophone Africa Web penetration

There are over 21 million Internet users in the 31 countries representing

francophonie Africa. Internet users in *francophonie* countries represent 42.3 percent of

the internet users total in Africa. The percentage of the population that is an Internet user

hovers around 5.5. The rest of Africa, the non-*francophonie* countries, is slightly lower in

terms of Internet penetration rate. The *francophonie* countries are faring slightly better

than the other African countries. See Table 2-2 for a comparison of the three.

Table 2-2: Internet in Africa, *francophonie* Africa, and the rest of Africa (Internet World Stats, 2008).

REGION	POPULATION	% WORLD POPULATION	INTERNET USERS	% INTERNET PENETRATION
Africa	955,206,348	14.3%	51,065,630	5.35%
Francophonie Africa	394,126,570	5.9%	21,616,830	5.48%
Rest of Africa	561,079,778	8.4%	29.448.800	5.25%

Comparing *francophonie* countries to the rest of the world yields quite a different

image. Although the countries that want to speak French and share information are on par

with other African countries in terms of Internet penetration, they are all far behind the

rest of the world. French is meant to assist these people in accessing modernity, but how

can French play a part if these people lack the means of getting online? See Table 2-3 for

a comparison.

Table 2-3: Internet in *francophonie* Africa and the rest of the world (Internet World Stats., 2008).

REGION	POPULATION	% WORLD POPULATION	% INTERNET PENETRATION
Francophonie Africa	394,126,570	5.9%	5.48%
Rest of World	572,0913,940	85.7%	24.7%
WORLD TOTAL	6,676,120,288	100.0%	21.9%

The growing information needs of French-speaking Africans in an increasingly

information-rich world could potentially be met by information created by and for this

unique group. Continental African French-speakers only account for 1.5% of the world's

Internet users (see Table 2-3). It is doubtful that a critical mass of users and content

exists. It is not realistic for Africa or Africans to expect to make a large impact on the

global information scene at this time because of the inadequate leadership demonstrated

by their national libraries and their limited representation on and access to the Internet.

2.7. Environmental Scan of Morocco

The developing country of Morocco has been selected as a case study for the

implementation of a theoretical CHDL. Because two aspects of DL creation are being

studied, the cultural usability and the system aspects, a comprehensive environmental

scan of Morocco is necessary.

2.7.1. Introduction

Morocco is an Islamic country on the northern part of the African continent

bordering both the Atlantic Ocean and the Mediterranean Sea. It is a developing country

of 34 million in an area of land roughly the size of California (CIA World Factbook, 2009). To the south, the Sahara separates Morocco from sub-Saharan peoples. The northernmost point of Morocco forms the Strait of Gibraltar with neighboring Spain. Morocco enjoys an advantageous location as a gateway to Africa and an entry point to Arab countries for Europeans. It serves as an exit point to Europe and the waters of the Atlantic or Mediterranean Sea for Africans. Gibraltar (U.K.) is visible from the city of Tangier when looking north across the strait. Morocco has been occupying Western Sahara in the 1970s after the withdrawal of the Spanish (CIA World Factbook, 2009) and officially considers the bulk of the Western Sahara to be Moroccan territory.

Morocco was initially settled by the Berbers, and was invaded by Phoenicians, Romans, and others in ancient times. Arabs brought their religion to this area in the 14th century, making Morocco a Western Muslim Arab land. Modern colonizers from Europe laid claim to Moroccan lands in the 19th and 20th centuries, but did not drive out the religion. The interactions of colonizers and the people of the country yield a complex modern landscape where the culture, language, and geography lend themselves to the creation of three kinds of groupings: continental (African), religious (Muslim (Arab)), and linguistic (Francophone).

Figure 2-7: Map of Morocco (CIA World Factbook, 2009)

Religion is one of the defining characteristics of Morocco. The majority, 98.7 percent of the population, is identified as Muslim. Christians have churches and continue to make their presence felt despite their small numbers, 1.1 percent of the total population. Before the founding of Israel, a Jewish community contributed more robustly to Moroccan religious diversity. Now, there are very few Jews who have remained in the country, with only 0.2 percent of the population being ethnically and religiously Jewish (CIA World Factbook, 2009). A politic of tolerance for all religions remains an overarching part of the Moroccan social fabric now, as it has for a millennium.

The relative homogeneity of religion is in stark contrast with the multiplicity of languages spoken by the people of Morocco. The official language of Morocco is Arabic and this official form, Modern Standard Arabic, is used for such things as official media communications. The Arabic of the people is Moroccan Arabic, which can be very

different from the Arabic dialects spoken in other Arab countries or from the Classical

Arabic used in the Koran. Descendants of Berber tribes-people continue to speak Berber

dialects, of which there are primarily three (Bensoukas, 2008). Northern Morocco was

colonized by the Spanish in the 1860s and Spanish is still spoken in these areas in

Morocco. Two disputed Spanish exclaves, Ceuta and Melilla, are in Morocco on the

Mediterranean. The whole of Morocco came under French rule as a French protectorate

in 1912 (CIA World Factbook, 2009). "Initially language was a powerful cultural element

intended to further the hegemonic interests of the colonialists and the settlers" (Ocholla,

2000, p. 34). Independence from France came in 1956, but French influence runs deep,

and linguistic ties to the French colonial era are still very strongly felt. French remains

the primary language for commerce and business in its former colony and is a sign of

wealth and privilege. It is French and not Arabic used by government employees in many

official transactions. Moroccans may speak a blend of Arabic and French, using words

from both languages in a single sentence. This blended spoken language, called l-ârancia,

is used by the upper- and educated-classes (Hargraves, 2007). Comprehension is

extremely difficult for those who speak only one of the two languages being combined.

2.7.2. Geographical regions

Morocco is located on the continent of Africa and can be grouped with other

African countries, or with other countries of similar heritage in the northern part of the

continent. The United Nations includes Morocco and six other North African Muslim

countries in a region it calls *Northern Africa*. Morocco is also part of the *Maghreb*, a sub-

set of the Northern African countries. Maghrebi countries are Muslim Arab lands in

North Africa, colonized by Europeans in modern times. Mauritania is a Saharan country,

but because of its French colonial past, it is sometimes included with North African and

Maghrebi countries. Western Sahara is also commonly added to these regional groupings for reasons of current Moroccan rule.

Morocco's most recent colonizers, the French, consider Morocco to be part of the French-speaking world. Although Arabic is the official language, Arabic is not a widely used language in commerce or in the sciences. Morocco relies on French for communication, especially on an international scale. Whereas other counties in the Arab world use English as a lingua franca, Morocco has an infrastructure established by the French from the time of the Protectorate. This infrastructure links Moroccans linguistically with other developing countries in Africa.

Morocco is primarily a Muslim-Arab country. The United States Department of State considers Morocco and the other Maghrebi countries of Algeria and Tunisia as part of the group of *Near Eastern* countries; they are grouped under this appellation with Egypt, Saudi Arabia, and the United Arab Emirates, as well as with countries located on the Arabian Peninsula (U.S. Dept. of State, 2009a), and thus classified separately from Sub-Saharan countries in Africa. UNESCO has a similar division, calling the Maghrebi countries, Mauritania, and Malta "Arab States" along with others in the Middle East (UNESCO, 2009b).

Moroccan views of the country's position in the world and peer countries differ to some extent from the groupings noted above. Morocco sees itself as North African or Maghrebi rather than African. When Moroccans speak of *Africans,* they tend to mean sub-Saharan Africans. Moroccans see North Africa and the Maghreb as being Mediterranean areas, not African ones. Moroccans may refer to themselves as Mediterranean in temperament, and the cuisine and climate of Morocco are likewise

Mediterranean. Linguistically, Morocco is a member of the states who identify as part of the *Francophonie*, using French for internal and external communication. This reliance on French as a former colony places Morocco with other francophone African countries, including sub-Saharan and West African ones. An alternate religion-based division of the world is also used in Morocco, where Morocco is seen as being part of the *Occident Musulman* (Muslim West, in Arabic: الغرب الإسلامي) which includes Muslim North Africa and the Andalusia region of Spain (Allouh, 1998) that was formerly ruled by Arabs. Lastly, Morocco sees itself as being in some ways European. A failed attempt at joining the twelve countries that formed the *European* Economic Community, the precursor to the European Union, in 1987 ("Common Market rejects Morocco," 1987) has not kept Morocco from signing trade and other agreements with the European Commission in the time since (European Commission, External Relations, 2009) as a southern Mediterranean neighbor (Environment, 2009). Morocco is an African country with aspirations for northern partnerships rather than southern ones.

2.7.3. Literacy and education

A result of its geographical, historical, and linguistic heritage, Morocco presents a diglossic and plurilingual society with the population speaking a variety of languages and having varying degrees of literacy. Morocco is the lowest-ranking of the five Maghrebi countries in terms of both adult literacy and school enrollment. Slightly over half of the adult population is literate (52.3 percent) and less than two-thirds of the school-aged population is enrolled in school (58 percent) (UN Development Programme, 2006). Disparities exist for those enrolled in school, as "the top 5 percent of pupils covered in the Progress in International Reading Literacy Survey (PIRLS) assessment registered scores comparable to those of the best pupils in high-achieving countries. But the scores

of the bottom 5 percent were less than one-fifth of those for top performers" (Global

Monitoring Report Team EFA, 2008, p. 12). Along with problems of disparity, the

question of quality can be raised. Only 26% of Moroccan 4th graders were able to reach

the level 1, or lowest, reading level. Only South Africa was lower, with 22% of its

students reading at the most basic level. More than 95% of children in most of North

America and Europe were reading at that most basic level or beyond. (Global Monitoring

Report Team EFA, 2008, p. 111). UNESCO estimates 9.8 million Moroccans are

functionally illiterate (Global Monitoring Report Team EFA, 2008, p. 94). Morocco lags

behind other Maghrebi and North African countries for both adult literacy and school

enrollment. See Table 2-4 to compare Morocco to other Muslim countries in North

Africa.

Table 2-4: Maghrebi Education Indicators, 2004 (UN Development Programme 2006).

COUNTRY	ADULT LITERACY RATE (%)	SCHOOL ENROLMENT (%)
Libya	81.7	94
Tunisia	74.3	75
Algeria	69.9	73
Egypt	71.4	76
Morocco	52.3	58

A primarily Muslim people, Moroccans will not necessarily view literacy in the

same way as Western and Christian peoples, and have developed an approach to

education that is in line with firmly held religious beliefs that are reinforced through the

government. "Traditional rote-learning educational methods do not foster innovation or

change" (Danowitz, Nassef, & Goodman, 1995). The Koran, the sacred scripture in

Islam, has endured for Muslims in part as an oral tradition, a work to be memorized by

heart and recited. The word of God was a "miracle of linguistic perfection" (Pedersen,

1984, quoted in Hover, 2007, p. 31) and passed down as part of an "auditory experience"

(Atiyeh, 1995, quoted in Hover, 2007, p. 31). For a millennium, it was religious scribes who produced manuscripts by hand, eschewing the printing press in the time after its invention. Hover states that "orality is prominent among the traditions that nurtured Arabic book culture" (2007, p. 31), including ones that preceded Islam. The lack of emphasis on democratic and personal literacy is in keeping with this long-standing tradition of recitation. It is difficult to understand why Morocco's seemingly privileged geographical position and historical interaction with outsiders has not led to greater emphasis on education than in other parts of Islamic North Africa, and can be explored further by examining the French approach to education and governance in Morocco.

French colonizers asserted their power by enforcing the use of French instead of Arabic during the protectorate. Education, government, and business all were conducted in the language of the colonizer. "Arabic had been relegated to a secondary position . . . leading to deep divides over educational policy" (Planet Contreras, 2007, p. 112). The colonial head of the French government in Morocco, Maréchal Lyautey, chose not to meddle in Muslim affairs of religion. From the time that Lyautey took power, no non-Muslim was allowed inside the mosques of Morocco. The Moroccan tradition of restricting non-Muslims from visiting their mosques remains to this day. In other parts of the Middle East and even in New Jersey (M. Hofmann, personal communication, October 2009), non-Muslim visitors are welcomed into mosques. During the Protectorate, Lyautey did permit French educational institutions to operate as they had in other colonial territories, where an elite few were educated in French. In the new millennium, fifty years after the official withdrawal of the French, Moroccan governmental reforms are changing the language of instruction in state-supported schools. Primary and

secondary schools now teach in Arabic (Planet Contreras, 2007), which, being the standard form, is still a foreign language for students. The Moroccan educational system introduces French from the third year of primary school (Hargraves, 2007). Currently, English, German, Italian, and Spanish are introduced in the third year of middle school (Gund, 2009). English is an attractive foreign language for Moroccans because it is international and European without being the language of a former colonizer. In education, international trade, and diplomacy, English is popular (Ennaji & Sadiqi, 2008). Despite its appeal, English has not come close to replacing French or Standard Arabic as a preferred second language for the Moroccan people.

Both French and Standard Arabic are used in state-sponsored institutions of higher education. The humanities and social sciences are taught in Standard Arabic, but mathematics and the sciences, including Library and Information Science, are taught wholly in French (*"MACECE Manual for U.S. Grantees,"* 2008). Concerns have been documented over the impact of this "linguistic rupture" (*"MACECE Manual for U.S. Grantees,"* 2008, p. 17) as it may be dissuading study in the sciences and other disciplines where the language of instruction is French. A third choice, for those with the financial resources and linguistic background, is to attend the semi-private Al Akhawayn University in Ifrane (AUI). The AUI is an English-language university located in the Middle Atlas region; courses are entirely in English and the entrance examination permits access to students with high levels of mastery of English. The campus has a distinctly American look, and offers dorms for students, a student health center, and a mosque. The university is entirely secular and initially banned head scarves for women; rules have since changed. The AUI is active internationally with related English-speaking groups.

The AUI's library is part of the AMICAL (American International Consortium of Academic Libraries) group and is one of four libraries in Morocco that is a member of OCLC (OCLC, 2008), aligning itself wholly with the English-speaking West. Both the library and the university at AUI have hosted Fulbright Scholars from the United States. The campus is American in style, and the location in the Atlas Mountains receives snow in the winter months (see Figure 2-8).

Figure 2-8: AUI Campus, Ifrane, Morocco, November 2008.

State-sponsored Moroccan universities have been undergoing restructuring since 2001 when the government's reform charter was launched (Erhif & Belmekki, 2007). The principal goals of promoting science and development included changes in the libraries that support higher education. Libraries are understood to have a leading role in the transmission of information at the university level in Morocco. The perceived importance of the library is leading to reforms that include forming inter-library partnerships, modernizing document handling, reorganizing reading rooms, purchasing databases via consortial agreement, and others (Erhif & Belmekki, 2007). The reforms are a way of enabling libraries and universities to work together with the objective of supporting and

enhancing education. The reforms are necessary now, as instructors who have been

trained at French universities may continue to enforce methods of teaching and learning

that have been abandoned in Europe since the signing of the Bologna Accords.

Table 2-5: Commitment to education: public spending (Human Development Report, 2007/2008)

COMMITMENT TO EDUCATION: PUBLIC SPENDING	YEAR	%
Public expenditure on education (% of GDP)	1991	5.0
	2002-05	6.7
Public expenditure on education (% of total government expenditure)	1991	26.3
	2002-05	27.2
Current public expenditure on education, pre-primary and primary (as % of all levels)	1991	35
	2002-05	45
Current public expenditure on education, secondary (% of all levels)	1991	49
	2002-05	38
Current public expenditure on education, tertiary (% of all levels)	1991	16
	2002-05	16

Table 2-6: Literacy rates, Males to Females in 2005 (Human Development Report, 2007/2008)

AGE GROUP IN MOROCCO	% FEMALE LITERATE	RATIO OF FEMALE RATE TO MALE
Adult literacy rate (aged 15 and older)	39.6	0.6
Youth literacy rate (aged 15-24)	60.5	0.75

2.7.4. Information and communication technologies

Information technology is increasing an essential part of modern life in Morocco

and is a domain in which Moroccan librarians must be competent if they wish to provide

superior service to patrons. Use of new technologies, especially communication-based

ones, is on the rise in developing countries and in Morocco in particular. The table below

(Table 2-7) shows the increase in percentage of users of technology over a fifteen-year

time period.

Table 2-7: Technology: Diffusion over Time (Human Development Report, 2007/2008)

MOROCCAN TECHNOLOGY	YEAR	N^O PER 1,000 PEOPLE
Telephone mainlines	1990	17
	2005	44
Cellular subscribers	1990	(.)
	2005	411
Internet users	1990	0
	2005	152

Mobile phone penetration has been on the rise in the developing world, especially in Africa. Morocco is among the five leading African countries in terms of number of mobile phone subscribers (United Nations Conference on Trade and Development, 2007*).* Morocco, along with Maghrebi countries Algeria and Tunisia, is also one of several countries in Africa to have a cellular phone penetration of more than 50 percent. Non-literate Moroccans and other non-literate people (Brady, Dyson, & Asela, 2008) have been observed to use text messaging features on mobile phones; therefore, not all of the communication taking place through the use of mobile phones is speech-based. See Table 2-8 for current information about telephone and Internet use.

Table 2-8: Technology: Users and Hosts (CIA World Factbook, 2009)

MOROCCAN TECHNOLOGY	YEAR	NUMBER
Telephones - mainlines	2006	1,266,000
Telephones - mobile cellular	2006	16,005,000
Internet hosts	2007	137,187
Internet users	2006	6,100,000

2.7.5. Attitudes toward technology

Information and communication technologies can be used for casual and serious purposes. Communication with known individuals such as friends or family can take place through the use of ICTs. Telephones, cellular phones, or Internet services are all ICTs in use in Morocco. Certain ICTs, especially computer-based ones, also allow users to socialize with unknown computer users from the world over. Internet chat rooms are one way that Moroccans can communicate with other ICT users on an international scale without the need for physical travel. "Chat is perceived as a playful activity, a form of entertainment, a therapeutic agent, and a game that does not require the disclosure of true

identify from the beginning" (Gunawardena, Idrissi-Alami, Jayatilleke & Bouachrine, 2008, p. 529). The anonymous aspect of the communication makes chat very appealing to a large group of Moroccans and the convenience of ICTs for communication in general has a very real appeal.

Cellular telephone connections require only a device and a service; both are becoming standard in Morocco and are not difficult to procure. Using ICTs such as chat require Internet connectivity through a computer terminal; the requirement of expense products and services could be a barrier to use for the average Moroccan, an example of what researchers term the digital divide, or in the terminology of Norris, the *global divide* and *social divide* (Norris, 2001). According to the *Information Economy Report*, Morocco has the highest Internet penetration on the African continent, with 19.9 percent (UNCTD, 2007, p. 25) of Moroccans having Internet access. Relative to other African countries when Internet access averages around 5 percent, Moroccan access is advanced. The United Nations Conference on Trade and Development report also confirms Morocco has the highest number of broadband Internet subscribers in Africa. The number of subscribers (390,000) only represents 1.3 percent of the population in Morocco which seems low by Western standards. Access is improving all the time, and new services offered by Internet Service Providers (ISPs) are increasingly allowing opportunities for connections, including the sale of pay-as-you-go USB modems through the telephone and cell phone providers[12].

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[12] As of October 2009, the three major telephone providers offer USB modems:
Maroc Telecom (the oldest telecom) offers a 3G service: http://www.iam.ma/Particuliers/Internet/
FormulesdAbonnement/Menara3GplusFormuleSansAbonnement/Pages/ContenuOffre.aspx; Meditel, the historical competitor of Maroc Telecom, offers USB modems: http://www.meditel3gplus.ma/; Wana, the newest

Cyber cafés have developed as a way of meeting user demand for Internet services. Gender issues at play in society can surface when studying ICTs and Internet cafés. "In Morocco, the Café was and still is the domain of men and this transferred to the concept of the Internet Café as well" (Gunawardena, et al., p. 527).

Men assert their dominance in the public sphere, including the café and Internet café. It is possible to find women taking part in social elements of ICTs and going to Internet cafés as well. Online chat rooms are equally open to men and women, and women are able to participate with a sense of freedom that they may not enjoy in traditional non-anonymous face-to-face communication with Moroccan peers (Gunawardena, et al., p. 527).

ICTs may provide more than entertainment in Morocco; they may be encouraging new economic growth for the country and providing jobs for individuals. Work on ICT4D also looks to them as an expanded possibility for employment for otherwise unschooled workers (Heeks, 2008). Traditionally, North Africa had such a surplus of able-bodied workers, it was difficult to see a need to automate work that a human could do (Danowitz, Nassef, & Goodman, 1995, p. 27) and make a living. For one school of higher education in Rabat, security guards living onsite are preferable to new technologies such as automatically locking doors (A. Alli, personal communication, October, 2008). Although supermarkets are popular in Rabat, none has a self-checkout lane.

New technologies that are fundamentally communication technologies are better-received by the population in general. Taking advantage of the Moroccan penchant for

telecom operator, offers four 490 Dh ($35 US) USB modems with a $25 pay-as-you-go monthly service: http://www.wana.ma/accueil-modems.php

communications, one of the new economic strategies succeeding in Morocco is offshoring. "Casashore" is an IT park in Casablanca, established in 2005, taking advantage of the Moroccan ICT industry; other cities host call centers as well. The offshoring work done at Casashore mainly involves French companies. Morocco's ICT industry is still in its infancy, but has been growing steadily from 2001 through 2007 (UNCTD, 2007).

2.7.6. Social challenges

Morocco knew a time of censorship and oppression under the former king, Hassan II. The period known as the Lead Years was marked by jailings and harsh treatment of dissidents. Liberalization began in 1995 with a series of reforms (Planet Contreras, 2007). With King Mohammed VI who has been in power since 1999, there is no longer the same degree of heightened concern for censorship or oppression. *Reporters sans frontiers* (Reporters without Borders) reports that two Moroccan journalists were jailed in 2003. They also report that Ali Lmrabet, a director of publication in Morocco, was sentenced to three years in prison because of caricatures and an interview on the Western Sahara that displeased the king (Reporters sans frontières, 2004). The threat to loss of control over the media in the age of the Internet is another element to be considered in the introduction of information technologies (Danowitz, Nassef & Goodman, 1995) that go beyond peer to peer communications models to allow broadcasting of new or subversive ideas in the online environment.

Software piracy is also a challenge in Morocco. Official showings of pirated films in theatres in Casablanca are commonplace and go unchecked by the government (Cherkaoui, personal communication, November 2008). Entrepreneurs will sell pirated films on the street, with the creation and sale of such discs becoming a new cottage

industry (A. Ryan, personal communication, April 2009). Music discs are also made and sold from makeshift carts and in stalls and stands in the market. The merchant in Figure 2-9 below had created a merchandise cart that also housed a boom-box with speakers to advertise his wares. Software piracy throughout the Middle East has been a deterrent to the creation of national and regional software industries, but it has also done a lot to increase computer literacy (Goodman & Green, 1992).

Figure 2-9: Entrepreneur with Boom-Box Cart Selling Pirated Discs at the Akari Market., Morocco.

2.7.7. Conclusion

Although Morocco is advantageously situated geographically and in terms of modern Internet infrastructures, its poorest people remain unschooled and illiterate. The multiplicity of languages has created a situation where online information can only be usefully accessed by a literate elite who master international languages. Little is being done at the level of information policy to equalize the imbalance.

Chapter 3

Models

3.1. Introduction

Based on the previous review of the literature, a new framework for the creation of a CHDL is described. The recommendations put forth in this section are closely aligned with standard practice for the creation of access. However, the novel aspect of this research is that it describes anticipated access by citizens who are illiterate and uneducated. The cultural values of these people will necessarily be different from those acknowledged in the West. Accordingly, the differences in the learned behavior of non-literate citizens will require a novel approach to interface design and implementation.

3.2. Cultural Usability as Novel Approach

It is possible to consider culture and usability together as a single feature influencing design and localization. When Hofstede's pyramid (Figure 2-1) and the dual factors affecting access in Universal Usability (Figure 2-3) are considered together, both culture and personal traits can be seen to play a role in usability and access (See Figure 3-1). Systems-related recommendations can be made regarding techniques for access in the developing world. When these systems are localized for use by a certain group, both cultural elements and personal elements will influence the user's perception of that system. Universal elements of design can be taken directly from Western research about design if the element pertains to a basic human reaction that is not learned and cannot be influenced by culture. A learned behavior such as the reaction to a certain color or type of images is not universal. It is not expected that non-literate users will come to the system with any mental model or expectations, other than the expectation in some cultures that

such a system surely cannot be meant for them. Developing strategies to overcome these

hurdles and encourage adoption of the system is outside of the scope of the present study.

Cultural Usability: Personal and Cultural Factors
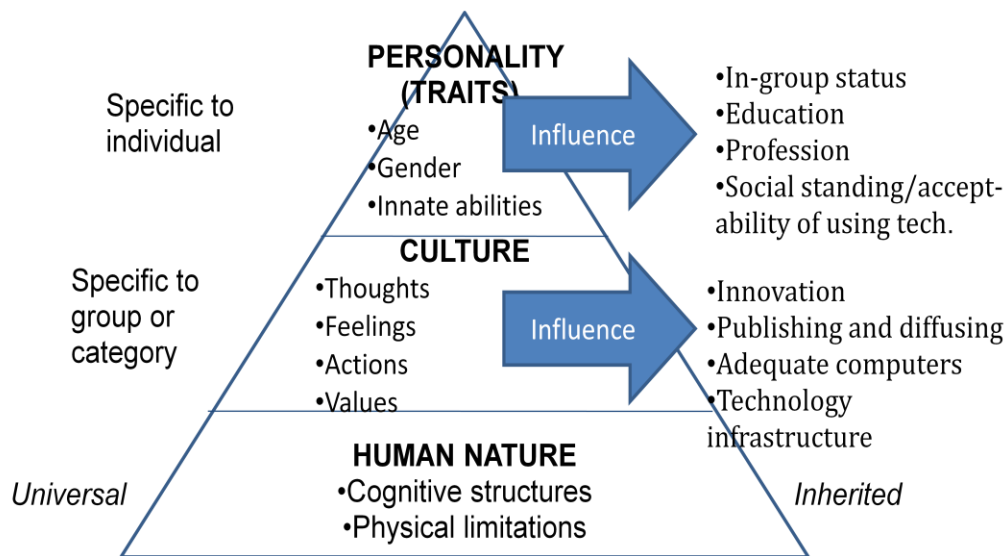
Figure 3-1: Hofstede's (1980) Model of Culture Overlaid with Factors Affecting Access.

Design must be informed by the universal elements that are part of Human

Nature. In the instance of a CHDL, it is not necessary to bypass a study of culture to go

directly to the study of the individual. Culture is a difficult layer to describe, but it may

be the only accessible layer of the top two for people in developing countries. The

approach suggested is a shift from traditional Western practices for user-centered design

to a culture-based approach that considers the culture, and not the individual as the

smallest unit of study in the creation of design.
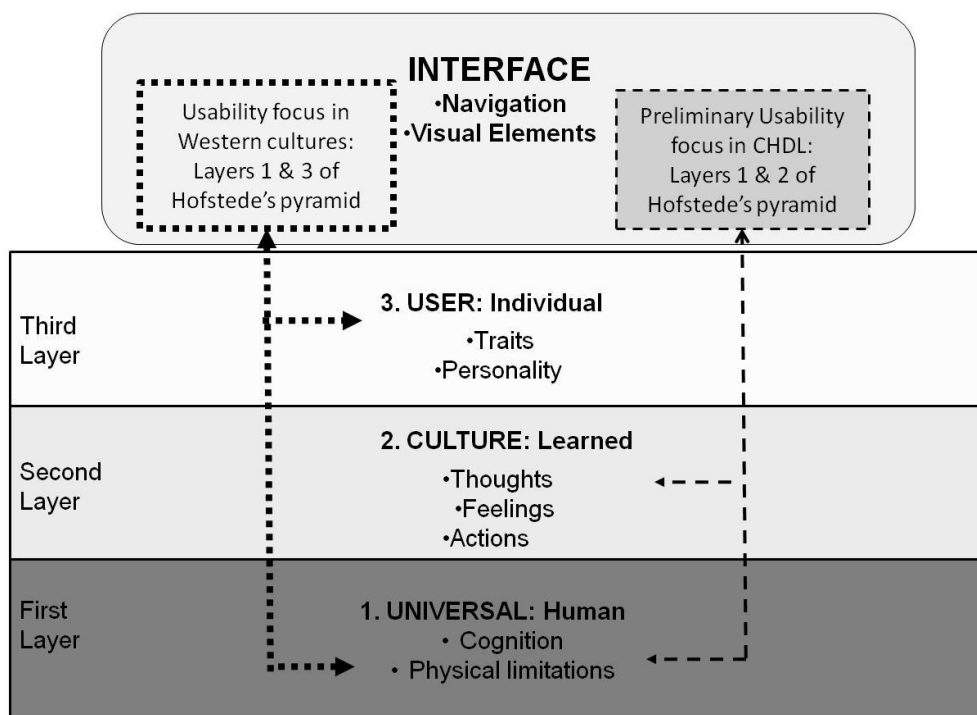
Figure 3-2: Layers of "Mental Programming" as the Basis for Usability Study.

From the combined model of culture and factors affecting access, it is possible to express these same notions in a way adapted to a framework for the creation of a CHDL. The model proposed below (Figure 3-3) is a slight variation from the concepts proposed by Hofstede (1980, 2005) who at separate times placed community and culture as the layer to "mental programming" immediately underneath that of the individual in the pyramid. Adapting this concept and visualizing it through the use of a Venn diagram, culture as defined it in this study influences both community and the individual. Culture should not be equated with the community from this perspective. This modified perspective permits the exploration of a national culture through the adaption with a single representative community and group of users. To evaluate the cultural usability of an interface, post facto studies will need to be carried out once the system is adopted by the community and the individual.

Culture's Influence on the Community and on the Individual

Community/Factors Shared by Users

Individual/Factors Unique to User as Member of a Group

Access to technology
•Adequate computers
•Adequate infrastructure

Society
•Innovation
•Publishing and diffusing info.

Politics
•Information policy

Culture
•Thoughts
•Feelings
•Actions
•Values

In-Group status
•Position in family

Individual status
•Profession
•Ability to read
•Social standing/accept-ability of using tech.

Demographics
•Age
•Gender
•Education

Figure 3-3: Factors Affecting Access: Personal and Community.

From the point of view of this project, culture is the most important variable to understand when building an interface for non-literate users. Elements of culture are already built into the metaphors, icons, and underlying structures offered to users in usability studies carried out in the developed world. This work needs to be re-invented for the developing world as a way to enhance success.

3.2.1. Recommended phases of the project

Based on the research presented in Chapter 2 and the models advanced in this chapter, it is inferred that usability testing of individuals, especially ones who come from non-Western cultures, may not yield results that are in line with Western usability expectations. Design and usability need to be reexamined in this very unique context. Users cannot be expected to assist identifying usability problems with a system if the users do not have any prior computing experience and if they do not have the "mental programming" to be critical in such situations. The desire to save face and to help the

researcher save face may hinder the honest communication of criticism. For this reason, interaction with the users in the context of a CHDL project is not recommended until Phase 3 of the design, although users and other stakeholders can be consulted about general systems aspects from Phase 1 onward. Phase 1 and the study of interface design begin with an investigation of the target culture and individual needs articulated in a general sense. This phase addresses the middle layer of culture put forth in Hofstede's pyramid. The interface should be localized primarily based on Phase 1, or cultural elements. Good practice in terms of design appealing to the universal or foundational layer of a user's "mental programming" should be applied as basic tenets of universal usability discussed earlier in Phase 2. Phase 3 or interaction with individual users making use of the system should be ongoing. Ranganathan's fourth law, where the time of the reader is to be saved, is actively observed in the creation of ongoing updates and improved access based on real use. The flow chart displayed below is unconventional in the world of standard usability testing, but is the recommended order of phases in the localization and implementation of a CHDL for non-literate users.

Flow Chart for a CHDL Interface Localization Project
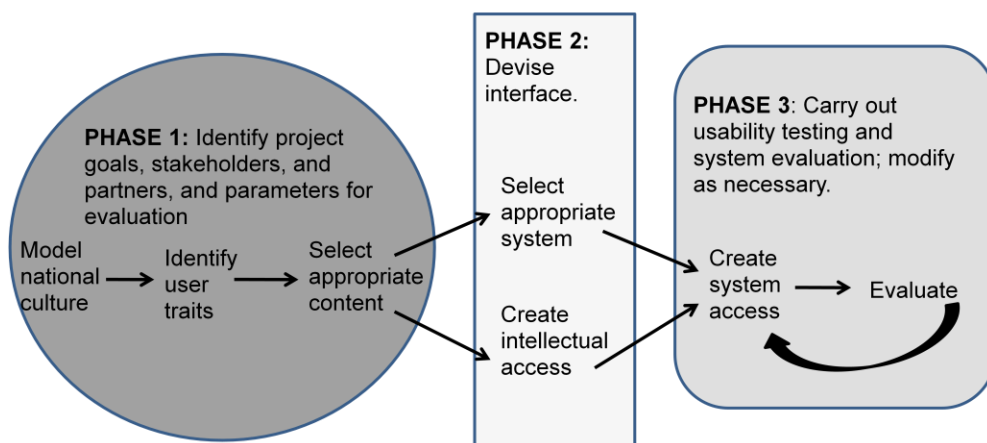
Figure 3-4: CHDL Design Flow Chart.

3.3. System Aspects

Systems aspects of the CHDL will remain tied to LIS theory. Elements that are

tied to notions of literate users seeking printed materials must be modified in the

environment of the developing world. Organization of information remains tied to

problems of meeting user expectations in the intellectual and descriptive access provided

in the system. Notions of information retrieval will differ from standard notions in the

field when they are applied to problems of information retrieval in the context of the

CHDL.

Traditional views of IR have been challenged as systems have become more

sophisticated and as research has shifted to the needs of users. It is the kind of model

presented below (see Figure 3-5) that Bates (1989) challenges by presenting her

berrypicking model. This model is nonetheless at the basis of many current systems,

where users are able to access information on their own, without the use of an

intermediary, through Web search engines or Web-mounted databases. This model

considers one user who, after identifying an information need, sets out on a search for the information. Information seekers may not always turn to IR systems to resolve their information needs; models of IR systems like the one below demonstrate in a simplistic way their interactions when they do.
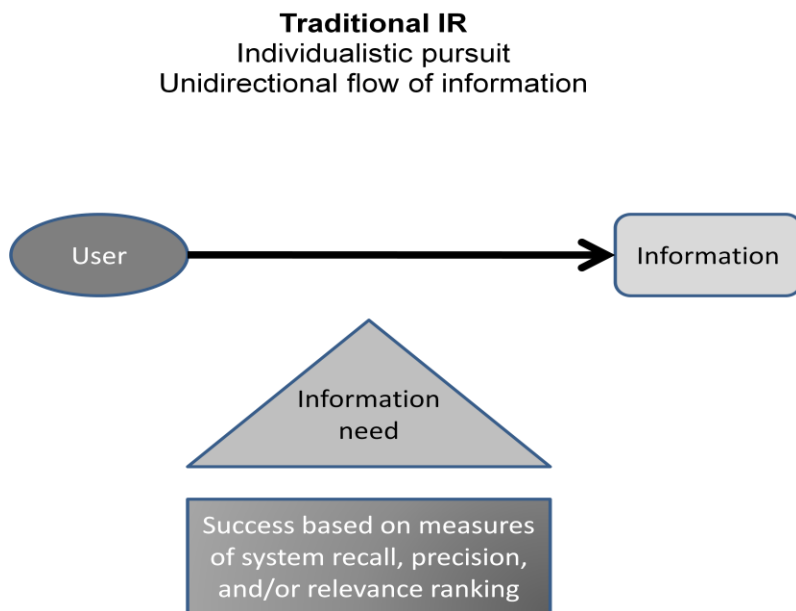
Figure 3-5: Traditional Model of IR as Individualistic Pursuit.

The above model, or variations of it, may work well for Western users who have become accustomed to seeking information in the Web environment. Cultural elements that support users in the developing world are absent from this model. It is also unclear how this model could apply when there is not an information need, but a social need met using technology. Evaluation metrics for standard IR systems will not apply in the CHDL context.

For a CHDL to be effective in the context of cultural usability, it needs to engage users while providing an information service. Information is typically passed from person

to person. With this context in mind, the following holistic model is proposed, taking into account users, non-users, and interviewees or subjects of CHDL documents. The expectation is that these community members are *de facto* stakeholders in any CHDL project; they already have their established methods of sharing information, both directly as person-to-person communication and by drawing from the collective knowledge that is part of the tradition of the culture. The whole of the process is collaborative in nature: users should never feel alone or isolated from their community while interacting with an information system.
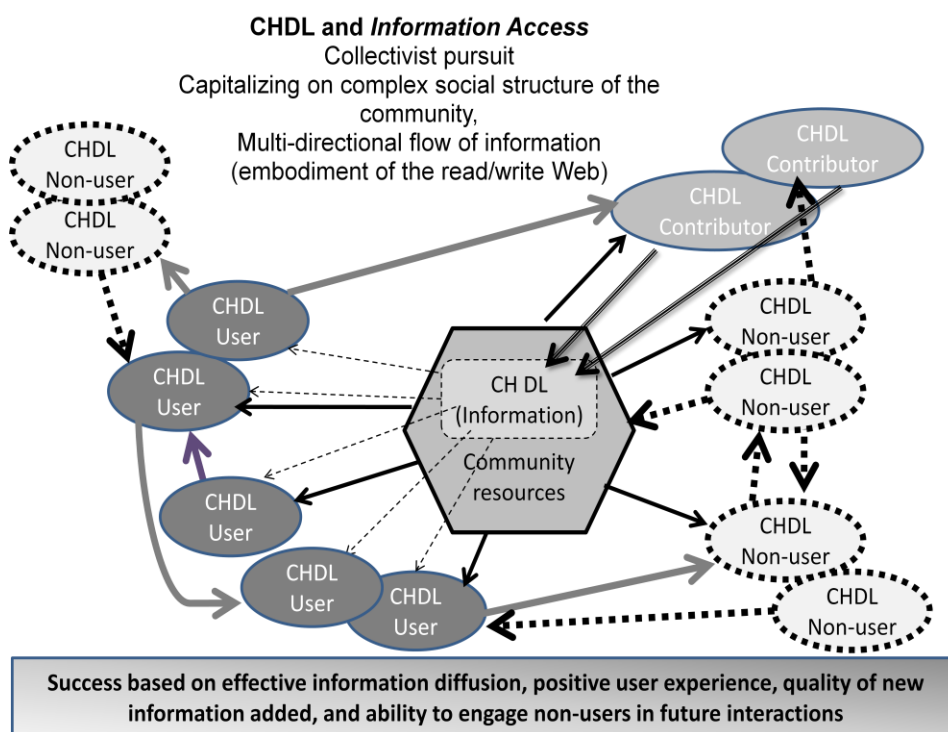
Figure 3-6: CHDL and Information Access in the Developing World.

The model that is proposed shows groups of community members, some of whom are users, others who are not users, and others who contributed to the contents of the CHDL by sharing their audio stories with researchers, being filmed, or as subject of

photographs. It is the expectation that once the CHDL is integrated fully in the life of the community, the status of community members vis-à-vis the system will evolve and change as they are initiated in the use of the system. In access, contributing, creating, and sharing content, those with whom content has been shared will be included in the group of CHDL users. As they begin in turn to create and share, they will enlarge their own circle. Information retrieval is replaced in this model by information sharing, the final of the four human activities.
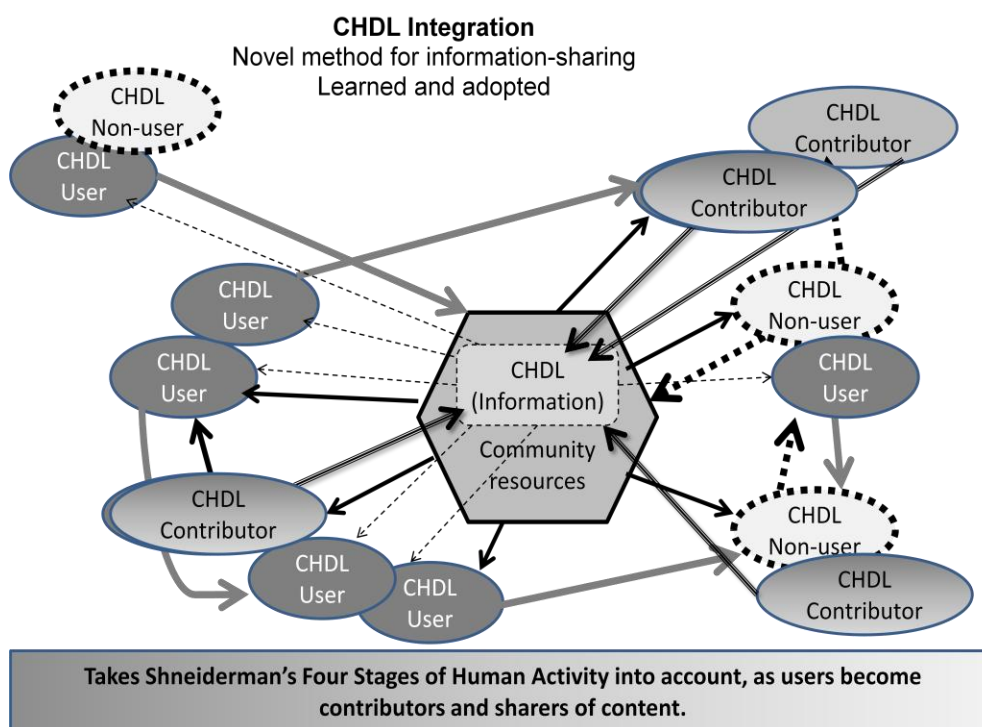
Figure 3-7: Creating and Sharing Content Changes Relationships with the CHDL.

By allowing for a circulation of information instead of a one-way linear flow in the traditional IR model, new content can be created, interest can be piqued and maintained, and read/write Web functionalities can be added to promote a satisfying user experience.

3.4. Conclusion

New approaches for the design and access to DL content must be advanced before work in this domain can begin, with culture being the most important element. Any work undertaken must take into consideration the learned behaviors of non-literate people and apply that knowledge to the organization, construction, and testing of appropriate interfaces.

Chapter 4

Methods

4.1. Significance

Non-literate citizens in the developing world are included in discussions of universal access and universal usability, yet no framework exists for design of appropriate DL interfaces for this user group. Although studies have investigated the design needs of non-literate users in the developing world, none has resulted in the creation of a framework for interface creation based on the culture of the non-literate citizen. Using the methodologies described below, this research seeks to explore questions of access for this user group.

4.2. Methodology

Through the creation of adequate models based in part on national culture and usability frameworks, this research seeks to define and propose a conceptual framework for DL interface creation and CHDL creation in the developing world. This study began with discussion of the purpose of the project, situating information and adult education problems of non-literate peoples in the developing world. The problem as defined contains two aspects: that of cultural usability and systems aspects. Conceptual frameworks that can be applied include Hofstede's cultural dimensions, the universal usability framework, and LIS theories of organization of information and IR theories. Based on these frameworks, this research seeks to explore the creation of appropriate DLs and interfaces for non-literate users. This study is based in part on time spent in Morocco as a Fulbright Scholar grantee. Fulbright is the "flagship international educational exchange program … designed to increase mutual understanding between the

people of the United States and the people of other countries" (U.S. Dept. of State, 2009b). When possible, theories will be applied to Morocco, which serve as a case study throughout this study.

4.2.1. Research methods

In order to answer the Research Questions posed in Chapter 1, a combination of ethnographic methodologies will be applied. We use the term "ethnographic" as Lindlof and Taylor do, as "describing and interpreting observed relationships between social practices and the systems of meaning in a particular milieu" (2002, p. 16). Unlike anthropological studies using ethnography, this study does not put forth research questions that seek to answer questions of *why* (D. Hodgson, personal communication, October 16, 2009). In writing (*-graphy*) about people (*ethno-*) and their relationships to information access based on a review of the literature and on informal interaction and observation, this study can nonetheless be considered an ethnography. Since there is no defining single method for ethnography (Lindlof & Taylor, 2002), this research adopts ones that best enable an exploration of the research questions as presented in Chapter 1. Klimaszewski and Nyce (2009) assert that in-country ethnographic research, along with an appropriate research methodology, is an effective way to research details necessary for a study. In keeping with the practice of ethnographic research in the social sciences, ten months were spent in the developing country of Morocco, interacting on a daily basis with non-literate taxi drivers, store keepers, housekeepers, and others and informally observing daily life and customs from the point of view of an insider.

Language is one of the most obvious elements of culture. During the period of study, deference was shown to Moroccans through the use of either a second or a foreign language. I never spoke in my native English with any Moroccan at any time, other than

with friends who wanted assistance learning or pronouncing English. With educated

Moroccans, I spoke in French. With uneducated Moroccans, I spoke in Derija to the best

of my ability. My language ability in Derija remains at the beginner level and I have a

vocabulary of only a few hundred words. Study at the Center for Cross-Cultural Learning

in Rabat, Morocco and informal lessons with my housekeeper and others served to

reinforce the language learning throughout my stay. Deep immersion through complete

linguistic immersion was not possible due to my inexperience with Derija; however, I

understand and speak enough to communicate effectively and politely with Moroccans.

Other cultural elements skills such as base-five counting and bargaining necessary for

transactions in the markets were also part of my informal education. At the market, if

wearing a jellabah and head scarf, I was addressed in Derija. When wearing Western

clothes, I was addressed in French. At ESI, I was only addressed in French by my

students and by other teachers. Much of the business around me was carried out in Derija.

Figure 4-1: A) Shopping at the Market of Akari with Nadia; B) 2nd Year Students at ESI.

In this study, the primary methodology is literature-based research which

examines the role of culture and interface design, focusing on non-literate citizens of the

developing world. Models describe the interaction of cultural usability and systems

aspects. Morocco serves as an example, and theoretical creation of a prototype CHDL will be explored based on the models put forth and a thorough environmental scan of the country. A scan of the information landscape such as the one reported in Chapter 2 is necessary for situating concrete elements of the cultures. For the hypothetical creation of a Moroccan prototype CHDL, this work benefited from in-country experience in the form of informal and opportunistic conversations, personal reflections on in-country experiences, and two content analyses of web sites in the Moroccan domain. Combing the literature-based research with in-country experience provides additional insight into the creation and application of the frameworks put forth.

This study explores cultural usability and systems aspects linked to DL use for non-literate users in the developing world. There are three primary ways to explore interface design for a repository such as a DL. Exploration can be done through the adaptation of new technologies, the creation of principles that can lead to predictions for good design, or empirical research where user studies are carried out (Guastello, Traut, & Korienek, 1989, p. 99). User studies are recommended to enhance usability. In the case of non-literate users in the developing world, user studies are not a practicable methodology for the reasons outlined in the discussion of national culture and universal usability; these issues will be revisited in the discussion of evaluation. Solutions to this problem include approximating user studies on non-literate users by asking literate users from similar areas to participate in their studies (c.f. Deo et al., 2004). This creative approach may be useful for the design of single systems, but inherent weaknesses of the methodology are acknowledged by the researchers. Instance where researchers carried out studies using member of primarily non-literate groups from non western cultures shed more light on

the differences between cultures then on the usability of the system. User responses

attempted to please the researchers rather than share difficulties with the system

(Duncker, 2002); difficulties encountered by users were imagined to be their own.

Empirical studies of non-literate groups at present are not an appropriate methodology for

the creation of a conceptual framework. The methodology proposed in this study

therefore is not based on empirical research. It focuses on the creation of principles

through the formation of models that will guide design and serve as the foundation of a

conceptual framework. The adoption of new technologies during the design process will

not be considered a methodology, but is acknowledged to be an important part of this

project.

4.2.2. Literature review

By the 1980s, interface designers were no longer the only users of computer

systems. In LIS, this period coincides with the Turn, which moved the focus of

information systems away from the power of the computer to concentrate on the needs of

the user. Usability was considered not only in terms of computer interfaces, but for

design problems from the mundane to the very complex. Work in design and usability

from this time period remain vital and readable more than 20 years hence (c.f Norman,

1988/2002). It was also at that point that interfaces for certain user groups were first

engineered. Visually and hearing impaired users, as well as illiterate users from

developed countries, started seeing the development of interfaces engineered to meet

their particular needs (Blattner, 1989; Edwards, 1989; Gaver 1986; Gaver 1989).

A valid approach to the comprehension and exploration of design problems is the

creation of mental models. Conferences on the topic of mental models and their

application in HCI were held from the mid 1980s onward (Tauber & Ackermann, 1989).

Questions of design have primarily been explored in the Western context. Since the 1990s, researchers have exhibited an interest in the design of international user interfaces. Much of this work has been practical as opposed to theoretical. Nielsen has been a pioneer in the study of design and usability and was among the first to edit books focusing on international user interfaces.

Questions of culture and access had come into play since the 2000s and the rise of the Internet. Conferences devoted to culture and the use of new technologies provide a venue for interdisciplinary research. In the field of human computer interaction, Shneiderman describes usability as a concept that can be applied even in nontraditional settings due to the almost worldwide availability of the World Wide Web. The goal of Universal Usability is described, but the application is not laid out. Usable interfaces to web sites for nontraditional or disadvantaged western users have also received attention in the usability community, facilitating universal usability in developed countries.

4.2.3. Situating the problem: Morocco

In order to address the final research question on the feasibility of a localized implementation of a CHDL in Morocco, Morocco will be used as an illustrative example. Empirical studies with non-literate users unfamiliar with computer technology will not help in the creation of a conceptual framework or in the proof of concept that a prototype represents.

Informal conversations from daily life

Because I am not a Maghrebi studies scholar and am not fluent in Arabic, I began immersing myself in Moroccan culture through a preliminary review of English-language material before arriving in-country. Moroccans are thoroughly social people, and soon

after my arrival, I was able to partake in social aspects of daily life, albeit in French or

English, through a network of friends and colleagues that formed around me. Through

interactions with Moroccans and with other Fulbright grantees, I opportunistically was

able to acquire insights that complemented and even fed my understanding of the

literature about Morocco and the developing world. When the time came to begin work

on the research questions as defined in this study, I continued to draw inspiration from

the insights I had gained through conversations. As I reflected on appropriate icons,

geographic knowledge of the non-literate, and elements of the Moroccan mentality raised

in the literature, elements from chance conversations from my daily life helped me to

think about my topic in a way that made sense to me. Fulbright grantees are encouraged

to engage in cultural exchange as part of their experience and I was glad to have had at

the ready a solid group of colleagues, friends including Moroccans and Americans, and

students to talk about my experiences. Along with a study of the literature, these

fortuitous interactions helped me clarify my understanding of the readings and focus my

research questions in the context of Morocco.

Personal reflections of a Fulbright Scholar

Being hosted in Morocco as a Fulbright Senior Scholar visiting professor at ESI

provided me with incredible opportunities and obligations for interaction. At times, these

interactions were challenging to me. Through reflections on the literature and by virtue of

setting up a household in a very social neighborhood in Rabat, I leveraged a dual

perspective from which I could consider not only my immediate situation and daily life,

but also reflect on the design problem reported in this research. Many of my personal

reflections about daily life were recorded in the online forum of my blog, where ideas or

observations were commented and enriched by Americans, Moroccans who were students, friends, colleagues, and even my director, and other Internet users. Shortly after I mentioned in my blog some of the differences in student privacy policies in France, Morocco, and the United States, my school's director listed student privacy as an agenda item at our upcoming faculty meeting. In general, responses to my public reflections were extremely positive. Informal conversations with Fulbright grantees and discussions of their research also shaped my perceptions of potential uses and usefulness of such a system. My daily existence and work with the literature both served as a point of departure in working with the conceptual elements of interface design, my understanding of which were occasionally enriched through organic discussions with friends, colleagues, and Fulbright grantees in the course of normal conversation.

Content analysis of websites

Although empirical research with Moroccan users is not feasible at this time, the nascent Moroccan web can be analyzed. Analysis of national Web sites is a valid approach to understanding how culture might prefer to implement design (Barber & Badre, 1998; Cyr & Trevor-Smith, 2004).

Conceptual frameworks for the creation of digital libraries in developing countries, and in Morocco in particular, can be created. The resulting work is the product of a combination of methodological approaches, with literature-based research supplemented by the use of qualitative approaches. This study does not seek to generate data on a topic, but to explore the broad topic of access to information in the narrow scope of non-literate citizens in the developing world.

4.3. Justification for this Approach

Identifying essential principles is already seen as a valid methodology in the creation of usable interfaces. When developing systems for uneducated users who come from an oral tradition, usability testing that is successful in the West may not be applicable. Meaningful evaluation can only take place after a prototype has been successfully created, implemented, and endorsed. The conceptual framework to guide the creation, implementation, and endorsement of the digital library is a necessary first step that corresponds with the Research Questions put forth in this study.

The decision not to use human subjects in this research can be justified from a cultural viewpoint. In collectivist cultures, or cultures with a low individuality rating, it will be culturally difficult for users to understand that usability may be subjective. Human subjects testing requires special protection for vulnerable peoples such as children, prisoners, and the illiterate. Instead of using subjects from a protected group, this project prefers to develop its framework by basing the creation of guidelines on literature-based understanding of culture and by describing the application of this framework in the context of Morocco. This study is carried out through a thorough environmental scan of Morocco, the content analysis of Moroccan web sites, informal conversations with Moroccans, and the application of other theories discussed throughout the course of this research. The resulting suggestions, once created and implemented, may be tested in a secondary phase of research not discussed in this study.

4.4. Scope and Limitations

This study is primarily a literature-based exploration of the elements necessary for a framework for CHDL creation. Attempts to implement the recommendations and to test

them with users, as well as recommendations for technological advances that would facility use of a DL by non-literate users will be discussed in the section on future work.

4.4.1. The split with traditional user studies research

The research questions and methodology in this research are such that no human subjects testing is required. User experience studies would permit the collection of empirical data that could be used to compare this system usability or Moroccan users to other systems or users. Studies of the user experience, however, tend to use one or both of the two methods of testing: watching what users do, as with screen captures, or asking users to describe what they are doing, as with "think out loud" studies. Users who are novice users will not demonstrate problems with system usability, but with acquiring computer literacy. Even if users became adept very quickly, "think-out-loud" query studies are not effective in general because users may lack the ability to describe accurately what they are doing (Wacholder & Liu, 2006). This effect would be magnified with users who, not typically asked to describe their individual reactions, were to report on usability. These users cannot be expected to learn to use the system without the full infrastructure, including tutorials, gatekeeper buy in, and community support. The system cannot be meaningfully and accurately tested without the implementation of the prototype in the full infrastructure, requiring this exploratory stage of the research to be based on theoretical assumptions, splitting it from traditional user studies research to remain purely theoretical.

Chapter 5

Multicultural CHDL Design for the Developing World

5.1. Introduction

When designing for the developed world, designers use the term "multicultural" to mean Websites that are appealing to users coming from different cultures. Although the interface and underlying structures of the CHDL proposed in this study must be localized for elements that are not related to language *per se,* there are nonetheless general or multicultural elements that can be identified as essential to the creation of such a system. The use of the term multicultural is adapted in the context of this study to mean cultures of users in the developing world, an underrepresented group that is difficult to study. The structure of the interface and the underlying system will contribute to the potential success or failure of the CHDL, wherever it is used. For this reason, a great deal of informed thought must go into the general description for use in this new environment.

The multicultural version of the database designed for non-literate users in the developing world can be informed by principles, frameworks, and theories described in Chapter 2, but must nonetheless be adapted to this new user group. This chapter will explore further some guidelines for multicultural implementation in the developing world. Multicultural design considerations inform the look of the interface that non-literate users will access when using the system. In this chapter, elements of cultural usability and the underlying systems aspects will be discussed, within the frameworks described in previous chapters.

5.2. Cultural Usability

To create a CHDL interface adapted to non-literate users in the developing world, an exploration of cultural elements and usability must be undertaken.

5.2.1. Cultural dimensions to DL usage

Question of use, usage, and adoption of the CHDL must be examined from the point of view of cultures in the developing world. Barber and Badre (1998) developed a set of cultural markers based on investigations of Web sites. The cultural markers were the salient features, unique to a culture, which enhanced usage. The interest in cultural markers led Barber and Badre to coin the term "culturability" in the field of HCI. Cultural makers of interest in interface creation can include colors, symbols, icons, and navigational structures. A CHDL will have to incorporate elements of cultural usability if it will be user-friendly for non-literate peoples. Preferences in terms of the cultural markers described, both in terms of the interface and the underlying system, will need to be explored.

5.2.2. Universal usability and accessibility

Stated goals of universal usability are difficult to meet in locations where access to technology is limited. Infrastructure problems with electricity including outages and surges can pose difficulties for uninterrupted connections in parts of Africa (Corrado, 2007); ambient weather conditions in unprotected computer use environments may reduce the working life of machines. Rural citizens living in remote areas may have limited access to electricity and internet connections. Any CHDL system for use in developing countries must be built with these limitations in mind.

Since the 1990s there have been calls for improved interfaces to provide access to information in developing countries where bandwidth is limited (Goodman, Press, Ruth,

& Rutkowski, 1994). Special attention can be paid to design elements that lessen the bandwidth required for interaction. For example, Horton (2006) suggests that images look almost as good when 32 colors are used as when as when 256 are used. File size can be reduced without significant loss in terms of quality. Considering that machines may be old and connections slow, the lower quality may not be noticed by users, but the increase in download speed would.

5.2.3. Localization

Research has been carried out in the empirical study of localization of web interfaces for users of different cultures, and in particular, from different developed countries (Barber & Badre, 1998; Cyr & Trevor-Smith, 2004). These empirical studies compare features of interfaces, looking and elements such as the use of color, icons, page layout, and content. It is presumed that web sites from a certain country were in a certain language have been designed for and tested by local users. Cyr and Trevor-Smith (2004) investigated localization of web sites in the United States, Germany, and Japan. To compare cultural elements in Web design, researchers have selected representative Web pages for close analysis (Barber & Badre, 1998; Cyr & Trevor-Smith, 2004). This study methodology is only applicable when authentic examples of design can be identified for study. "Based on the small amount of research to date on this topic, users from different cultures appear to have different design characteristic preferences" (Cyr & Trevor-Smith, 2004, p. 1200); this inference along with the work on localization may carry over into the study of localization in the developing world.

5.2.3.1. Applying superficial localization

Although samples of deep localization may be impossible to find for the developing world, elements of superficial localization can be applied with ease. Del

Galdo's (1990) comprehensive list of design elements to render in non-English interfaces is useful when dealing with superficial changes to interfaces to meet the needs of user groups from a different national culture. Her work is especially applicable to translations of English Web sites into other languages and for users in other countries.

5.3. Library and Information Sciences Aspects

The LIS theories examined earlier in this study can be applied to the question of a CHDL in the context of a developing country. It is assumed that the underlying structure or "generic-core" (Yeo, 2001, p. 104) of the DL will accommodate the basic elements described in this section. The look and feel of the interface, including the structures used for providing access, will be described in a way that is superficially multicultural for countries in the developing world, and that will require deep localization to be implemented in a particular country.

5.3.1. Organizational Aspects

In DLs, a surrogate record for each document will be created; the surrogate, often along with the document, will become part of the searchable database. Standards guide the creation of the metadata in the surrogate. Each field of the surrogate houses certain kinds of information, systematically entered. These fields are indexed if they are to become access points. In standard full text databases, the full text of the document along with the fields of the surrogate will be included in a searchable inverted file of *keywords*; if there is no full text, all of the terms of the surrogate may be included in the inverted files for the access points and together in a *keywords* inverted file. Collocation in library stacks facilitates serendipitous retrieval via browsing. In the online environment, browsing instead of searching permits the discovery of documents (Cloonan & Dove, 2007), but can only work as intended if the underlying metadata have been created.

Because with digital collections, there is no opportunity to find the document physically as there is in a brick and mortar library, the data about the document must be correct, accurate, and construed in a way permitting the user to retrieve it.

The role of the metadata generated during the process of document analysis and description is to help organize the document and to anticipate the user's query based on the information need. Standardized ways for indicating factual information about the document guide input in the surrogate, and conventions for writing the title, the names of authors, publishers, different dates that pertain to the document, the collection name, and permissions must be agreed upon and practices rigorously applied. The task of providing access by subject or topic is less straightforward.

5.3.1.1. Categorization

Ontologies describe the world in a way that is meaningful to a particular culture. A taxonomy of terms will employ culturally-based logic as outlined by that ontological world view. Library of Congress Subject Headings (LCSH), for example, divide geographic regions of the world in a United States-centric fashion. Although Library and Archives Canada (LAC) borrows extensively from LCSH, there is still a need to add Canada-specific terms to the subject heading list. A French-speaking cataloging agency in Canada at the Université de Québec à Montréal (UQAM) has created its own thesaurus of descriptors based on the literary warrant provided by its own collection. A Saudi-funded library in Casablanca, the Bibliothèque Al Saoud, has created its own thesaurus of descriptors to describe works in its academic collections specializing in the social sciences in historically Muslim areas in the extreme western part of the Mediterranean. The first sub-class that this thesaurus proposed for geographical region is the Maghreb countries and Andalousia. It groups together under another sub-class all of North,

Central, and South America. In these practicing libraries, inquiry warrant, "the way in which professionals search for information in their literature" (Olson and Boll, 2001, p. 33), literary warrant, and the amount of materials on a location in physical library collections and the need for specificity contribute to the way materials are categorized by geographic location. These taxonomies are subjective, and "behind any taxonomy is a mindset about the world" (Crystal, 2006, p. 222).

A thesaurus that represents the world-view or mindset of the nation being studied, such as the thesaurus developed at the Bibliothèque Al Saoud, is recommended for use with the CHDL. The thesaurus should include descriptors for traditional and unique elements of the society, and ideally will offer hierarchical relationships between terms. Rules for the application of descriptors will need to be established locally. To meet the needs of all users, indexing should provide access to each important or noteworthy concept covered in the documents. Segments of very long audio or video files may be indexed separately, with access being given directly to the topical content described by individual descriptors. Online documents do not require classification in the LIS sense, where a unique code is given to an item so that it may be stored near items that are similar in topic. Virtual documents are less suited to being classified (Velluci, 2000) as there is no need to class them in one unique physical storage area (Shirky, 2005).

5.3.1.2 Access points

An access point is "any word or phrase used to obtain information from a retrieval tool or other organized system" (Taylor, 2006, p. 526). Title, author and subject names, topical descriptors, time period, geographic location, format, and keyword access to the description of the document are all standard access points in DLs. Because traditional access points are text-based, terms to be used as access points will not be automatically

extractable from non-textual documents housed in the CHDL. Access points will be created manually and encoded in the records for the electronic documents. Verbal access points for document titles and personal or corporate names in any context (author, publisher, subject, etc.) will not be adapted for non-literate users; text-based keyword access to text strings in the surrogate will also be excluded. Topical descriptors as defined in the thesaurus, time periods in the form of pre-established date ranges, latitude and longitude coordinates based on geographic location, and general format information based on file type and software for access will be retained and made available to users pictographically through specially designed browse menus.

Though metadata for each document will include text-based access points of interest to scholars, the interface and system for non-literate users will only offer limited access through graphical representations of the four indexes mentioned above. The interface for non-literate users will be less complex than a standard DL interface because they will not require direct user input as a query, but will instead require users to select content through browsing. The non-text based queries offered through the database will not be as sophisticated as ones for a scholarly user group, who will need to launch refined queries as they search for content. The four kinds of *pictorial* access points for non-literate users are the following:

- Subject
- Geographic location
- Time period/Date
- Format

Pictorial access points correspond directly with the icons described later in this chapter. Additional access points that are verbal can be created using select parts of CHDL documents, text-to-speech software, and on-topic user-created audio comments

associated with the surrogate in the database. Access to verbal access points will not be

included in preliminary prototypes, but would be a feature to enable in future iterations of

the interface as users progress in sophistication in their use of the system and as the

read/write Web functionalities become more commonplace in open source DL platforms.

5.3.1.3. Indexing for access points

Although full indexing can and should be done to provide researchers with

traditional text-based access, each document should also be indexed for the four pictorial

access points defined earlier. Indexing for the four access points is a cultural marker that

needs to be adapted to each user group. Indexing for non-literate access will need to be

based on inquiry warrant, not literary warrant as a means of facilitating retrieval. The

high-level multicultural format will remain homogenous, with possible localization

choice differences in choice of icons or method of representation. Subject descriptors

from the thesaurus will have to map directly to images. Time will be divided into periods

logical to the user group in question, and may coincide with political regimes, natural

occurrences such as droughts, or other noteworthy events in the collective lives of the

inhabitants. Geography will divide the country into standard areas such as departments or

provinces. Format will be the most straightforward, and efforts will be made to adhere to

conventions in use on the Web so that users might become more computer literate overall

with the use of the CHDL. Each CHDL document should ideally have at least one

pictorial access point for each index.

Each indexing term should be mapped to terms in native languages and scripts so

that semi-literate or literate citizens or researchers of a variety of backgrounds can search

in the database. These terms could be mapped to spoken words in the electronic

documents in the process of automatic indexing. Methods of automated subject analysis

should be developed to create automatic metadata for documents in the digital library.

5.3.1.4. Metadata schema

Metadata schema must be Web-friendly and flexible enough to support a

minimum of two interfaces (non-literate and researcher) to the material housed in the

database. Because organizations in the developing world may choose to focus financial

resources on other aspects of the project, open source schema like the Dublin Core

Metadata Initiative (DCMI) used in open source products endorsed by UNESCO present

a viable option.

5.3.2. Retrieval Aspects

Audio-visual documents historically represent challenges for retrieval in standard

text-based environments. Retrieval for A/V documents depends on the metadata included

with the documents, as features of the document other than format (author, title, subject,

and publication information) are difficult to extract from and A/V document itself.

Documents should be retrievable without the need for users to present the system with a

standard text-based query. Launching a browse emanates from the icons; the query icons

are directly linked to the four access points established above. The access point-based

icons will enable a browse on a field, using the underlying metadata. One additional

index can be chosen to limit further the results. At any given point, either "most popular"

documents or "more [documents] like this" should be offered as suggestions in a field

separated from the query icons to facilitate discovery.

This system of browsing without having launched a text-based query is similar to

the system offered by YouTube and other sites or widgets that offer access to databases

of online video. Users familiar with YouTube will not be able to search within the DL of

cultural heritage materials, but users will be able to begin the exploration of the database contents by clicking on icons of interest and selecting "more like this" or by recommencing the browse. Some of the perceived benefits of and drawbacks to the system as it is proposed are listed below.

Benefits

1. Because there are no text-based queries, there is less potential for user error.
2. The risk of failure is mitigated since icons are only clickable if there is something in that index.
3. Users will be able to browse documents.

Drawbacks

1. Specific documents will not be findable.
2. Documents can only be browsed based on the four access point icons.
3. The system will not be able to respond with a relevancy ranking of results.

5.3.2.1. Audio

Documents that are purely audio pose the most difficult problems in terms of providing access. These documents may be very well-suited to use by member of an oral culture, but do not provide immediate visual context for users. A/V documents in the database may include recordings of citizens that distinctive accents or pronunciations. The subject analysis included as part of the work flow in the accession of documents will render all audio documents equally findable through the use of the controlled vocabulary.

Segmentation of long audio files should help users navigate to parts of the document that are of interest without being confusing or unduly complex. Methods have

been developed to enable users to browse or skim segments of audio files. Arons (1997) used a number of methods, including removing pauses, overlapping speech, and others in his SpeechSkimmer. Concepts of speed and urgency may differ in developed countries, and the artificial compression of speech for browsing and skimming may prove to be more disorienting than helpful to CHDL users.

5.3.2.2. Multilingual retrieval

Even within a single national culture, more than one language may be spoken by citizens depending on their location. The language of the former colonizer may provide a means for interacting with outsiders, but that language will need to be learned, presumably in a formal setting. Uneducated and non-literate citizens may need to speak more than one language in order to interact with neighbors or, as is the case with Muslims in countries where Standard Arabic is not the local dialect, to pray. Problems of multilingual retrieval will be mitigated though the use of icons and browsing, where each controlled vocabulary term will be mapped to a single representative icon. Use will not be as straightforward, as some audio documents will not be in a language understood by the user.

Only in instances where there is clearly the use of one dialect among all users of a localized DL can spoken audio features be combined with the icons, menus, and navigation. Spoken audio could appear as voice-overs and spoken menus on the interface, but care would need to be taken not to create distractions that would inhibit the use of the system. One representative image of a landmark or well known feature from each location will be used to guide users in pictorial mouse-overs. The spoken name of the province could be used in single-language situations as verbal mouse-overs if that is appropriate.

5.3.3. Systems Aspects and the Read/Write Web

Non-literate CHDL users will not be able to participate in the Read/Write Web to the same extent as their educated counterparts. A CHDL offering adapted methods of participation will enable non-literate users to become familiar with this democratic aspect of Web use.

5.3.3.1. Open source DL platforms

Several open source platforms could house the electronic documents efficiently while respecting optimum conditions for access. Not all would allow for the customization required for the various phases of the project's creation and implementation as described in this chapter and the preceding one. Ideally, enhancements to the DL made for this purpose would benefit the entire community of users.

UNESCO endorses the open source DL platform Greenstone. A robust user community shares modifications and enhancements to the platform. To facilitate compatibility with similar DL projects, Greenstone is recommended. Ultimately, the choice of a platform depends on the organization maintaining the DL, the data being stored, the metadata schema chosen, and the type of access being offered based on the needs of the users.

5.3.3.2. Read/Write access

User-generated content is important in both the developed and the developing worlds (Jones, Thom, Bainbridge, & Frohlich, 2009). Western research proposes that Internet users feel invested once they have participated in the organization of an online resource or have marked a resource so that they may find it again. The CHDL should permit similar read/write access for its users; read/write functionalities are not functionalities built into the Greenstone software package at this time. Ideally, users

should be able to interact with the AV documents, hear the comments of other members of the community, share their own points of view, and return to the document at a later time. The egalitarian nature of the read/write Web and the interactions it permits echo a collectivist community structure in the online environment. Until fully functioning read/write elements of the system can be put into place, showing the most popular resources in a moving band across the bottom or along the side of the screen would be an effective way of showing users what peers are accessing.

5.4. Interface Creation

The DL interface provides the user with access to its documents. A technology-neutral definition of an *interface* is "a go-between". In the context of DLs, an interface can be defined as "the point or process that joins two components of a data processing system, for example, the screen display that functions as intermediary between a software program and its human users" ("Interface," 2007). The interface will be manipulated by the users from the developing world who are non-literate. To be usable, the interface must meet the needs of this target user group and should be localized to respond to national culture, including a maximum number of elements to make the system usable by diverse users based on individual factors.

For design to function, there needs to be 1) a good conceptual model available to users and 2) things need to be visible (Norman, 2002, p. 13). To meet the needs of non-literate digital library users from developing countries, the framework for universal usability user requirements as outlined by Deo et al. (2004) should be applied. As a complement to those requirements, the following recommendations for the multicultural interface design are presented.

Esthetically Pleasing

An interface that is attractive according to the local sense of esthetics should be created

through consultation with local designers who understand the culture.

Simple to Use

The interface should be as free as possible from frustrations for users. Because it is

assumed that non-literate users will be developing computer literacy at the same time that

they begin to use the DL, the interface must be straightforward, having predictable

outcomes for user actions and repeating conventions from screen to screen.

Simple to Understand

In recommendations for phone interfaces for users in the developing world, Chipchase

(2008) suggests offering only minimal features to avoid frustrations. That same simplicity

should be applied to DLs.

Free of visual clutter

Blinking or moving elements that do not have specific meaning in the interface should be

avoided. Internet users from developed countries will have become accustomed to

moving advertisements. There is a "learned strategy to devalue motion as a source of

information on the Web. This behavior may be compared to 'banner blindness'" ("Eye

Tracking," 2009). Researchers have hypothesized that the visual capacity that evolved in

humans is superior to the visual acuity in other animals so that snakes could be spotted

(Isbell, 2006). Visual movement will likely overload and distract or frustrate the non-

literate user who has not developed banner blindness. Suddenly-appearing information in

the form of mouse-overs should be used only if the information will be immediately

relevant in the context of the use and will merit immediate examination by the user.

Free Of Auditory Clutter

Sounds that are not meaningful in the context of the search should be avoided.

Free Of Culturally-Bound Computer Metaphors

Computing metaphors in use may not have meaning outside of the cultures where they were created. Metaphors used in computing may not be understood the same way across different cultures (Duncker, 2002). Concepts such as "pages", "trash cans" and "shopping carts" are computing metaphors used in American interfaces (Marcus, 2005, p. 52). American vendors historically create operating systems and computer applications (Choong & Salvendy, 1998; Yeo, 2001) and technology designed and produced in industrialized countries is "culturally biased in favor of their social and cultural systems" (Hill, 1998).

Free Of Extraneous Metaphors

In the DL for non-literate users, elements of the interface will convey meaning as concretely as possible and guide the user's interaction with the system. Exploiting library metaphors by grouping sets of documents into "collections" or listing materials in alphabetical order instead of listing them in an order that is meaningful to the user, such as geographic, chronological, by relevancy, or other does not lend itself to usability in the context of an interface for non-literate users.

An interface devoid of text, and without computing or library metaphors, will need to rely on accurate representation and intuitive navigation through the use of other visual and of audio elements. Visual elements will include numbers in the form of dates and images, which themselves are metaphors since they always stand for something else

(Shirk & Smith, 1994). The images should be unambiguous. Text may appear in the logo for the name of the database and in logos and links to sponsoring institutions at the bottom of the home page. Audio elements ideally will not use spoken language, especially if the target user group may be composed of individuals who have different mother tongues. Visual elements and audio elements must be applied consistently throughout the database and in a way that is culturally appropriate.

5.4.1. Structure and Hierarchy

Primary access to the DL will take place through the Web-mounted homepage, which will serve as a search interface. In accordance with user-centered design guidelines, the DL seeks to create "user interfaces that generate feelings of mastery, satisfaction with accomplishment, and a sense of responsibility" (Shneiderman, 2002, p. 65).

5.4.1.2 Task model

The mental model as a basis for this DL is a task model (Paterno', 2002). The expected user goal is the following: *Accessing cultural heritage information*. Task analysis of the goal has been obtained using a combination of the techniques "considering how activities are performed in the current environment" and "considering existing documentation and training methods" (Paterno', 2002, p. 819). The resulting list of user tasks is short:

- Identify A/V documents of interest
- Retrieve A/V documents

Based on the task model, including the expected user goals and the task analysis, browses of specific DL indexes will be the main user actions. Browses are launched by clicking buttons on the interface. Four kinds of access points should be indexed and made

searchable via the buttons: **subject** index terms which will be assigned using one or more

controlled vocabularies, **geographic location** which will use map coordinates or

controlled vocabularies for location, **time period** using date ranges, and **file format**

which will describe the type of document as opposed to the file type or file extension.

Only browses that yield hits will appear on a search screen as a possible button; buttons

that will not launch a browse on a particular screen will be grayed out.

5.4.2. Navigation

Navigation within the DL should be limited and predictable and only as

sophisticated as necessary to allow users to accomplish the user tasks that have been

identified. To move down in the hierarchy of pages from the homepage, users will click a

button (an icon, map or time period) to launch a browse. A model for the hierarchy of the

website tracing the navigation down through the levels is shown in Figure 5-1. Broader

and shallower hierarchies are more user-friendly since they require fewer clicks to arrive

at a resource and since they are less confusing if there is a need for backtracking

(Shneiderman, 2002, p. 67). The flatness of the model allows for no more than two clicks

before arriving at a final results screen where users will either begin selecting documents

or will start over. All results pages, including the page for the document itself, will have a

homepage icon at the top of the page. The homepage button will be a miniature version

of the actual homepage and will function in lieu of a browser back button. The home

page icon will allow users to return to the home page at any time and start over,

alleviating the frustration of a mis-executed search. Users comfortable with browsers or

who have participated in Web searches with literate members of the in-group may use the

back button to return to previous pages. However, the concept of "back" is culture-

dependent; arrows pointing "back" in one culture may be pointing "forwards" in another.

The most reliable means of navigating to the home page is by providing a button on the interface that links to it.
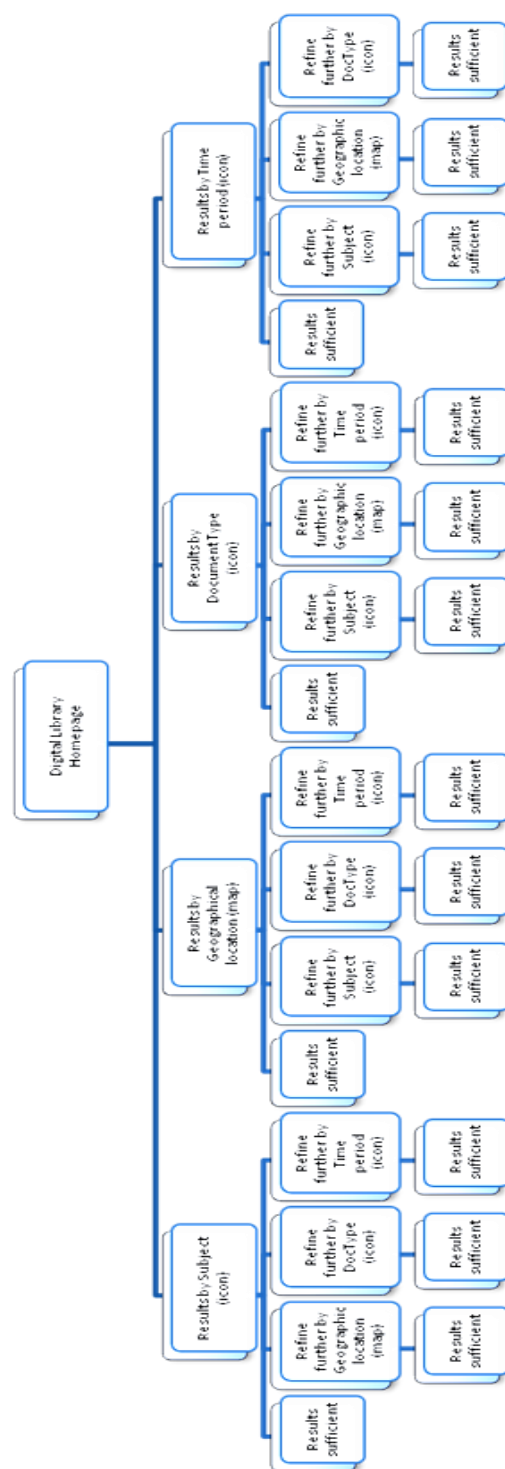
Figure 5-1: Sample Hierarchy for a CHDL

5.4.2.1. Second-level results pages

Once a search has been launched in one of the indexes, the screen on the second level of the hierarchy will provide a list of results. Users may begin to access files directly from this first page of results. At the top of the results screen, the icon, the location, or the date range will be repeated as confirmation of the browse that was launched. The symbol will be grayed out and clicking on it will not re-launch the search. Responses on the second-level results page will be grouped primarily by format if the search was by subject, location, and time period. For images, thumbnails are sufficient to display (Deo et al., 2004, p. 6) and might be grouped together in a section that is sensitive to the direction in which literate people in the culture read. When clicked, the thumbnails will enlarge, and icons representing the rest of the associated metadata will be displayed. Videos will show a thumbnail of the video with a small triangle indicating "play" featuring prominently over the still frame. This mimics YouTube's display. YouTube and other video sharing websites are known in different parts of the world, including in the developing world. The replication of the convention for displaying stills for video should be maintained. Audio files will have to be displayed using the icon for audio. Audio files should be organized by language.

5.4.2.2. Refining the query

From the initial results screen, it should be possible to limit the results based on the three indexes not yet chosen. The database should only propose limits that will yield results; if no items would be retrieved from a limit based on a certain category, then that category will not be possible to select as a limit. The advantages of this system are that there will always be a list of results for users as a result of an operation. Frustration with no results will be kept to a minimum.

Searches by file format will yield a second screen with the other three indexes depicted in the same way as on the primary search screen, only in a smaller format. Clicking on any of these three types of buttons will limit the search.

5.4.2.3. Calling up the document

To access a document in the DL, users will click on the thumbnail for images and video or on the icon for audio. The document will appear on a new page and will be the featured element on the screen. Because interfaces for YouTube and photo-sharing sites may already be used by literate and non-literate citizens in developing countries, it will be possible to present results pages that replicate the design and functionalities of these commonly used social sites. Images must be visible in their entirety when selected. Images, unlike text, cannot automatically be resized based on the width of the browser (Horton, 2006, p. 85). For this reason, full-sized images will be viewed at roughly the same dimensions as Flickr photos to avoid the problem of displaying a photo in a browser that is not visible in its entirety. Audio and video will use integrated players when possible, requiring the fewest plug-ins and downloads on the part of the user.

For navigation away from the document page, three options will be available:

- *More like this* (other results from current browse)

- *Top-level browse of an index* (second level of the site's hierarchy)

- *Start over* (top level of the site's hierarchy; homepage)

More like this will be shown in the form of additional thumbnails along the top of the page. By clicking on any of the thumbnails, the new document will open. Modified icons showing the *Top-level browse of an index* will be listed in a column next to the document. Clicking any of them will re-launch a browse of that index. At the top of the

document page in the center of the screen, the icon for the homepage will be present. This will allow users to abandon the result and *Start over* on the main homepage.

5.4.3. Hardware

No special hardware should be required for non-literate user access to the DL, especially if it is meant to be accessible over the Web. The DL would ideally be accessed via touch-screen computers in a public setting, but since touch screen technology is prohibitively expensive for institutions in developing countries at this point, the recommendation is to make use of standard instruments such as the keyboard and the mouse. Adaptations to facilitate the use of both will be apparent in the interface.

Figure 5-2: French/Arabic Keyboard Sold in Morocco with Prominent ENTER Key.

Keyboard

It is not expected that users will want to use keyboards, but may have seen other community members doing so, and should be allowed to try. To select a button and launch a search or open a document, users may use the Enter key on the keyboard. Keyboards depict Enter by writing the word using text, by displaying the arrow symbol, or both. In the developing world, computers and keyboards do not have one specific provenance; thus is it reasonable to expect that keyboards will differ. The keyboard arrow keys will be functional for navigation, but are not expected to be as widely used as the

mouse. Keyboard-based options will be available to users of the CHDL interface, but will not be promoted as the primary means of interacting with it.

Mouse

Although the use of a mouse is unintuitive at first, many non-literate people who become users of cultural heritage DLs may be familiar with the concept. Users may have been exposed to television programs showing computer use and mice or may have been in the room with a literate countryman who was using a computer. It could be expected that the principles behind the use of the mouse will be understood to some extent, but that the application will be difficult for non computer-literate, especially at first.

To simplify access, a single mouse click of a button will launch the search. Double clicking is not advised, as a user's coordination should not be a requirement for access. It is assumed that there will be no scroll wheel, and that a left, right, or center click will all count as a click.

The CHDL sponsor will need to invest in Web servers adequate to provide reliable access and fast searches. If that agency will also provide on-site access, access will take place in a way that puts users at ease, makes them feel that it is their place, even their obligation, to use the DL, to engage with the technology, and to share what they have learned with family and friends. Success with mobile books on demand and bookmobiles in developing countries may foretell a successful interaction with the DL if it can be loaded onto a mobile PC and taken to the users.

5.4.4. Visual elements

Visual elements play an important role in an interface. A DL environment that is text-free will require the use of meaningful visual elements. Visual elements naturally play a role in oral cultures, with many oral cultures relying on paintings and carvings, along with stories and songs, to transmit information (Duncker, 2002. p. 224). In a DL interface for non-literate people, only buttons that launch browses of pre-established indexes will be pictured on the home page of the DL. Because we are referring to a Graphical User Interface (GUI), the term "buttons" is employed to mean any element on an interface that can be depressed by the user to launch an effect and can refer to objects or operations (Blattner, Sumikawa, & Greenberg, 1989). Before GUIs were ubiquitous and before the creation of the World Wide Web, some researchers differentiated between icons and buttons. At the time, buttons were metaphorically akin to a header on a printed page, were repeated in the same way from screen to screen, and signaled routine motions (Shirk & Smith, 1994). In the GUI available on the Web, the browser through which the DL will be viewed will provide directional buttons, in this pre-GUI sense of the term. For the DL interface, the icon is the visual appearing on top of the button, indicating to the user what will follow once it has been pushed.

Icons are "graphical symbols that visually represent information in the computer display" (Blattner, Sumikawa, & Greenberg, 1989, p. 12). They are small in size and representational in quality. Icons have the advantage of concisely representing information. However, poor icon design can lead to confusion (Shirk & Smith, 1994). Cultural differences will influence the design of and preference for icons. Americans and other literate computer users prefer and are more efficient using icons that include both images and text (c.f. Kacmar & Carey, 1991; Guastello, Traut, & Korienek, 1989);

Americans will prefer text to images if a combined mode is not possible in the creation of the icon. Icons with pictorial elements but without text are preferred in China (Choong & Salvendy, 1998, p. 427). In the interface for the DL, icons will represent concrete objects and events as much as possible, and will not represent metaphors for computer processes or library use.

Blattner, Sukikawa and Greenberg identify three types of icons: representational, abstract, and semi-abstract (1989, p. 16). Representational icons are concrete depictions that may be simplified for clarity. Abstract icons use geometrical shapes to symbolize meaning. Semi-abstract icons are both representational and abstract, with an image so stylized that it appears to be abstracted. Icons in the DL for non-literate users from developing countries will be representational or semi-abstract to avoid ambiguity, will be pattern-rich, and will exploit shape and color along with page layout. Shneiderman in states that color is an appropriate way to show relationships among components for consistency when creating user-centered designs (2002, p. 65).In accordance with Marcus and Gould's suggestion for design for countries with a strong Uncertainty Avoidance Index (UAI) such as Arab countries and Latin American countries, the repeated use of pattern will emphasize "Redundant cues (color, typography, sound, etc.) to reduce ambiguity" (Marcus & Gould, 2000, p. 41). Guidelines given in this study suggest one multicultural approach to design. All images and icons representing objects or metaphors should be tested with members of the target culture (Knight et al., 2008) and modified accordingly.

5.4.4.1. Content icons

Icons provide access to the intellectual content of the DL. Icons should be used sparingly to avoid the "cognitive overload" associated with "overly dense visual

displays" (Ramsey & Atwood, 1980, quoted in Blattner, Sumikawa, and Greenberg,

1989). Research should be done with members of the target group to solicit meaningful

renderings of concepts before creating the icons (Medhi, Prasad, & Toyama, 2007). The

content icons for a multimedia cultural heritage database fall into two categories: format

and subject. A third group, navigational icons, was discussed in the section on

Navigation.

- Format icons will represent the three format types in use: image files, audio files, or video files. Each of the three format types will have a culturally relevant icon which when clicked will launch a search for documents having that format.
- Subject icons will represent the topic(s) of the document. No more than ten top-level subject icons will be displayed at a time, as ten seems to be the upper limit for broad classes based on internationally successful decimal classifications like the Dewey Decimal Classification and the Universal Decimal Classification systems.

5.4.4.2. Maps

Non-literate citizens will likely have a good concept of the geography of their

country and of their city in relation to the rest of the country. Moroccan taxi drivers,

whether or not they are literate, are able to take their driver's exam and to navigate the

streets of the city without problem. When they are unable to identify a destination, they

ask other taxi drivers when stopped at red lights. As an element of an interface, maps

function as a way of suggesting location within the country without the use of words. A

map with clickable portions that represent political divisions can provide specific access

to documents of any format and on any topic. Featuring images of familiar landmarks

associated with an area may supply additional information for users uncertain about

geography.

5.4.4.2. Numbers

Non-literate users are not necessarily innumerate, even if numeracy is typically a product of structured learning (Chipchase, 2008). The use of numbers and a time-line is valid in a non-textual interface for illiterates, as many users will understand and read numbers. Dates such as birth dates or familiarity with money and cell phones reinforce the use of numbers in developing countries. Dates or date ranges can be superimposed over buttons launching a browse of time periods using a date-writing convention that is standard in the culture.

5.4.5. Audio elements

Audio elements can enhance computer interfaces, making them easier to use. Studies have focused on the use of auditory elements in interfaces for blind users (Edwards, 1989; Petrie, Morley, McNally, O'Neill, & Majoe, 1997; Pitt, & Edwards, 1996). These studies focus on the spoken word as a replacement for text commonly found in interfaces for sighted users. Gaver (1986) developed an operating system in the 1980s that exploited sound, or what he called "auditory icons" to confirm aurally operations being carried out in the interface. The operating system, named SonicFinder used sound metaphors to reinforce the visual elements represented by the icons (Gaver, 1989). Analogously, video games and computer games rely heavily on the use of sound to transmit information to the gamer. These sounds have meaning in the context of the game.

In providing access to non-literate users from primarily oral cultures, it makes sense to exploit as many senses as possible, including hearing. Listening is important in cultures where information is transmitted orally in face-to-face communications. The use of sound in interfaces for illiterate users has not received the same kind of scholarly

attention as the use of sound for visually impaired users. Two types of sounds can be interpreted meaningfully in the context of the interface: spoken words and meaningful sounds or *earcons*. Both will be explored in the following sections.

5.4.5.1. Spoken words

One option for communicating information in an interface for non-literate users is spoken recordings of menu information. The verbal rendering of information that is typically given textually could assist non-literate users. A mouse over of the icons can result in the pronunciation of the word, having the same effect for illiterates as written text would for literate users.

Spoken words have the advantage of disambiguating icons for users in case of doubt. The use of spoken words must be carefully applied, as the choice of word in terms of register and regional dialect, the accent used in the pronunciation, the voice used to record the words will all have an effect on user perceptions of the experience. The voice of a young uneducated man from the countryside saying the words quickly in his dialect would have a very different effect from the voice of an older city-dwelling woman pronouncing words slowly and with careful articulation. In the case of a DL collection designed for illiterate users, the voice of a typical target user would be preferable. Studies will need to be carried out to ascertain the exact term that is best for each topic.

5.4.5.2. Earcons

Blattner, Sumikawa and Greenberg define earcons as "nonverbal audio messages used in the user-computer interface to provide information to the user about some computer object, operation, or interaction" (1989, p. 13). Earcons, or brief meaning-rich sounds that enhance the use of icons or actions taken by the user, were initially designed for use in standard interfaces. Earcons differ from "auditory icons" created at Apple as

described by Gaver (1986). Auditory icons are representative sounds that further exploit the desktop metaphor in use in the operating system. An example of an auditory icon would be the sound of an envelope hitting a metal container to represent the metaphorical sound of a message arriving. These are precisely the kinds of metaphors that are extremely culture-dependent and would only be meaningfully developed for a single group of users at a time. The development of desktop metaphors coupled with appropriate auditory icons for non-literate non-Western peoples is outside of the scope of this research.

The application of earcons in interfaces for non-literate users should be explored as a way to promote interaction on an aural level. Blattner, Sumikawa and Greenberg equate the similarities between text and icons to the similarities between spoken words and earcons (Blattner, Sumikawa, & Greenberg, 1989, p. 14). In an interface used by non-literate people of differing linguistic backgrounds, earcons may be brief noises that substitute for the spoken word associated with verbal elements. Unlike spoken word menus or explanations of icons, earcons can also be used to indicate that a process has been carried out in the interface. The danger inherent in presenting earcons or abstracted audio as an integrated part of the interface is the monotonous repetition of sound (Shirk & Smith, 1994, p. 3 of 10).

In the interface for non-literate users, earcons will be reserved for signaling that an action has been launched or is taking place in the database. Where images guide the queries, sounds indicate that the process within the database has begun. The decision to promote earcons goes against the decision of Deo et al. to associate representative earcons with the mouse-overs of icons in the interface. We opt not to implement this use

of earcons for the sake of consistency. While it would be very simple to add mouse-over earcons that are representative of format (camera shutter sound for photos, film reels spinning for video, and microphone crackles for audio) it would be extremely difficult to supply representative, non verbal earcons that represent in the exact same way the content that will be retrieved when other buttons are clicked. There is no sound for maps, topics, or dates that can easily be produced to supply the same kind of meaning to the users. Therefore, although we acknowledge that the use of earcons in association with mouse-overs is a good idea in general, it is not practicable in the kind of cultural heritage database described here.

Earcons that are used will instead be semi-representative and will draw on users' knowledge of ICTs. Users in the developing world will likely be very used to cell phones. Certain sounds indicate when the phone is carrying out actions; these sounds could be adapted in the DL interface for similar functions, creating a metaphor that ties the DL back to known technologies instead of to unknown constructions like desktop computing, Web interfaces, or library organization. In situations where cell phones usually make a sound when a digit is dialed on the keypad, the DL could use a similar sound in terms of pitch and tone to indicate that a click was registered and that the search has been launched. The system could also make a ringing sound as the search is being carried out. There could be a click similar to the click that comes with a phone being answered when the results have loaded as a way of signaling the user that a new phase in the search process is underway. Audio elements, like sound and video files, will need to be anticipated when providing workstations that access the database in public settings.

5.4.6. Accessibility compliance

The interface must be compliant with all current W3C Web Accessibility Initiative (WAI) recommendations for accessibility as published in the Web Content Accessibility Guidelines (WCAG: http://www.w3.org/TR/WCAG20/). Although the interface may be most readily accessed by users at public workstations or via laptop on bookmobiles, it will also be available on the World Wide Web. The four principles of accessibility (perceivable, operable, understandable, and robust) should provide a framework for basic design choices. For users in the developing world, national-level infrastructure may be problematic. The digital library should require low bandwidth to facilitate access over slow connections. Although the interface being described is only being designed for a non-literate but sighted audience, there is the possibility of adapting it for other special classes of users such as children or the visually impaired, if it adheres to the WCAG.

5.4.7. Evaluation

In this section, we will consider two kinds of evaluation: system evaluation and usability evaluation. Both types of evaluation were initially described in the first and third phases of CHDL creation (see Figure 3-4); both consider the experience from the point of view of the users. System evaluation will attempt to gauge the extent to which the system responded to user expectations based on the goals set forth in the first phase. At that point, designers "Identify project goals, stakeholders, partners, and parameters for evaluation." Usability evaluation is described briefly in the third phase of implementation. It is concerned with a user's interaction with the interface as part of the HCI, and can be judged independently of the overarching goals of the project.

5.4.7.1. System evaluation

Precision and recall are traditional measures of evaluation that cannot apply in an

environment where browses, and not searches, are being launched. A novel method of

system evaluation must be put forth that takes into consideration broader project goals.

One system goal of a CHDL should be to promote the discovery of documents that are

interesting and noteworthy, similar to the goal of the PageRank system employed by

Google. Bates's (1989) berrypicking model required the creation of large databases with

different kinds of resources. Another system goal might be to provide documents in

different formats for each index item so that users have more control over the results they

choose. A third system goal might be to provide users with an engaging series of

documents that are accessible, relevant, and easy to use. Based on the goals of the

project, established through contact with the stakeholders and partners, measurable goals

should be outlined before moving to collect, organize, and index content. As the project

progresses, care should be taken to ensure that evaluation takes place and that system

goals are met.

5.4.7.1. Usability evaluation

Corresponding with the third phase of the CHDL creation, usability evaluation in

this context is the second kind of evaluation to be undertaken. "Usability evaluation is

concerned with collecting data about the usability of a product or design by a specific

group of users for a specific activity within a particular environment or work context"

(Porteous, Kirakowski, & Corbett, 1993, quoted in Yeo, 2001). Evaluation of

technologies in collectivist cultures though interactions with test subjects is different

from the experience that Western researchers will have. Duncker (2002) through user

testing of Māori people and Yeo (2001) through testing of Asians arrive at the conclusion

that testing and evaluation as carried out in individualist cultures of the West may not work elsewhere.

To permit usability evaluation, a localized ethnographic study will need to be carried out at the community level. A single village or community should be selected and gatekeepers identified. Klimaszewski and Nyce (2009) recommend first making members of marginalized communities aware of the importance and uniqueness of the collective information they possess (p. 224). As researchers demonstrate that CHDLs can work with users, they will begin to identify elements that should be modified, reworked, added, or even potentially removed.

5.5. Limitations

Due to the specialized nature of the interface, non-literate users will not be able to carry out the kinds of complex searches that literate users do in typical text-based DL interfaces. Accessing a well-defined group of documents in a short period of time is not one of the goals of this type of interface. Rather, this interfaces attempts to encourage user exploration through browsing and discovery. In doing so, it promotes computer usage and the goal of universal usability. Browsing and discovery should be able to take place regardless of the kind of machine the user is accessing or the bandwidth of the Internet connection

Although the basic CHDL that is described here makes use of open source DL software and does not require specialized equipment, some of the elements described in the creation of the interface will require highly trained and knowledgeable staff. Because systems staff play an essential intermediary role in interpreting the requirement of the design team and realizing them in the creation of the system's interface, it is important to

have a systems staff that is experienced and comfortable speaking English or an international language spoken by the designers. It is assumed that the programmers will need to consult regularly with the international DL community as they proceed with the creation and implementation of the CHDL.

5.6. Conclusion

Each developing country's culture will require different aspects to be brought forth in the interface. Caution is recommended when moving between cultures and adapting Web interfaces for usability, above and beyond a simple translation, as patterns reflecting culture are a result of the country and the genre of the site (Barber & Badre, 1998). The creation of the interface will be a culturally-sensitive task and the prototype will need to be tested with users in conditions similar to the conditions for use before it can be adopted. Many of the studies on icons and earcons were carried out using university students (c.f. Shirk & Smith, 1994, p. 6 of 10); and many of the studies of culture and information technology transfer used highly educated business men and women in the context of commerce and business (Hill et al., 1998). Similar reactions on the parts of non-literate people in the developing world cannot be assumed. In fact, there may be features that non-literates will notice, but that literate designers and testers of the system will not. An example of a non-literate parallel universe scenario is that of bank notes. While literate citizens may rely on bank note qualities that can be "read" (like the printing or the watermarks), Chipchase (2008) and his team observed non-literate Chinese and Indians using other cues to confirm authenticity. Once a suitable interface is created and implemented, regular testing should be done to insure that the continued response to user needs and seamless and efficient access are provided.

A record for each audio-visual document in the digital library must first be created, either by hand or electronically. The record houses information describing physical and intellectual properties of the document, and provides immediate access to the document for the user. Theories of organization and retrieval apply in online environments, but must be refined for use in specialized databases. Non-literate users of digital libraries require organizational schemes that are immediately intuitive and usable. Retrieval methods cannot require typing, but may require clicking once the user is accustomed to manipulating the computer.

Chapter 6

Suggested Implementations for Morocco

6.1. Introduction

Non-literate citizens in developing countries like Morocco may live in extreme poverty; for them, survival is a primary occupation and the basics of life are their most immediate needs. The Human Development Report ranks developing countries for a series of indicators. Morocco is in the lowest third of developing countries in terms of the overall poverty index, indicating that many Moroccans do not have a long and happy life with opportunities for education and a decent standard of living. Factors used to generate the poverty index include ones related to health and basic necessities. See Table 6-1 for some of the indicators used to calculate the poverty index. In Morocco, there is a 6.6 percent probability of not surviving to the age of 40. Seventeen percent of citizens are not using an improved water source, facilitating the spread of disease, and 10 percent of children under the age of five are underweight. In this context of physical challenges to survival, information needs are less important. Over the long term, however, information literacy and steps toward it may be a way to improve the quality of life for these citizens, empowering them to anticipate and meet their own information needs and move toward a more developed existence.

Table 6-1: Selected Indicators of Human Poverty for Morocco, Adapted (Human Development Report, 2009)

HUMAN POVERTY INDEX (HPI-1)	PROBABILITY OF NOT SURVIVING TO AGE 40 (%)	PEOPLE NOT USING AN IMPROVED WATER SOURCE (%)	CHILDREN UNDERWEIGHT FOR AGE (% AGED UNDER 5)
1. Czech Republic (1.5)	1. Hong Kong, China (SAR) (1.4)	1. Barbados (0)	1. Croatia (1)
96. Morocco (31.1)	65. Morocco (6.6)	91. Morocco (17)	62. Morocco (10)
135. Afghanistan (59.8)	153. Lesotho (47.4)	150. Afghanistan (78)	138. Bangladesh (48)

The Moroccan government has recently shown increased interest in providing information to its people. Initiatives have been underway to make university education accessible to a maximum number of students, and higher education may be free of cost at some state institutions. Libraries are officially seen as one of the primary ways that university education can be improved, this official focus on libraries highlights the importance of information in education and as well in the advancement of the country (Erhif & Belmekki, 2007). Universal usability had the goal in 2000 of making "90 percent of all households as successful users of information and communications services at least once a week" (Shneiderman, 2000, p. 85). In 2009, Morocco remains far from that goal. One way to encourage access to information in Morocco is through the creation of Web sites and interface that are adapted for the needs of all Moroccans, including the very poor and the uneducated.

6.2. Cultural Aspects

In considering the cultural aspects of Morocco, insight can be gained into the best way to create and provide access to a CHDL.

6.2.1. Hofstede's cultural dimensions applied

Hofstede's cultural dimensions identified in Chapter 2 are available for Morocco; although Morocco was not one of the original 53 countries for which Hofstede had IBM data, it was possible for him to generate scores for 21 additional countries, including Morocco, by extrapolating from the work of other researchers. The PDI and IDV for Morocco were based on a study of commercial airline pilots carried out by Helmreich and Merritt in 1998 (Hofstede, 2001, p. 126, 262). From a 1999 paper authored by Helmreich and Merritt with a third coauthor, it is possible to learn that these two American scholars are in the field of psychology, living and working in Texas (Helmreich, Merritt, &

Wilhelm, 1999); as with the other data generated by Hofstede, this country data was not created through ethnographic studies but through work with well-educated professionals. The remaining two scores for Morocco were taken directly from IBM survey values for seven Arabic-speaking countries in the Middle East (Hofstede, 2001, 502). Scores and ranks for the first four dimensions (PDI, IDV, MAS, UAI) are available for Morocco; the ranks given are relative to 74 other countries and areas. Hofstede's fifth cultural dimension, LTO, has not been developed for Morocco. Long Term Orientation is described by Hofstede in *Cultures and Organizations,* and the verbal description provides enough information to group Morocco with other Arabic-speaking countries as described. Verbal interpretations of each score for are the dimensions are also given. See Table 6-2 for the ranking of Morocco for all five cultural dimensions.

Table 6-2: Hofstede's Cultural Dimensions for Morocco

CULTURAL DIMENSION	SCORE FOR MOROCCO	RANK (OUT OF 74 COUNTRIES/REGIONS)	ASSESSMENT
Power Distance Index (PDI)	70	22nd-25th	Large Power Distance
Individualism Index (IDV)	46	33rd-35th	Collectivist
Masculinity Index (MAS)	53	31st-32nd	Masculine
Uncertainty Avoidance Index (UAI)	68	40th-41st	Strong Uncertainty Avoidance
Long-Term Orientation Index (LTO)	Fundamentalists, especially Muslim fundamentalists and Africa, especially sub-Saharan = Short Term (index not reported)	n/a	Short Term Orientation

Compiled from Hofstede & Hofstede, 2005, pp. 43, 78, 121, 169, 233-237.

Like other poor and developing countries, Morocco has a large power distance, is collectivist, and has a strong uncertainty avoidance. Like other Muslim countries in the Arab region, Morocco is considered to be masculine, a country that preserves (Western) gender roles for men and women. Like fundamentalist and African countries, Morocco has a short term orientation.

6.2.1.1. Limitations in the context of Morocco

Hofstede only describes a single dominant culture when describing Morocco. Morocco is not considered to be a multi-lingual country for this research. It is unclear which language was the basis for the cultural evaluation of the PDI and IDV, but Hofstede's work was entirely carried out in English. Because Moroccans who speak, read, and write English fluently belong to the upper classes by definition, their culture may be substantially different from the culture of poor Moroccans. Likewise, if they had been asked the questions in Arabic, Derija, Berber, or another local language that they may speak, they may have understood the question differently or come to an answer based on different reflections. Like other Maghreb countries, Morocco is in a difficult situation of using a colonizer's language for business, another foreign language for prayer, and a third or even fourth language for daily life. For a comparison of Morocco, France, and the Arabic-speaking countries of Egypt, Iraq, Kuwait, Lebanon, Libya, Saudi Arabia, and United Arab Emirates (Hofstede & Hofstede, 2005, p. 27); see Table 6-3. Both France and the Arab countries represent foreign languages spoken in Morocco; Morocco has the values of a shared religion with the Arab countries.

Table 6-3: Comparative Indexes for Morocco and Related Cultures.

CULTURAL DIMENSION	INDEX (0-100)		
	Morocco	France	Arab Countries
Power Distance Index (PDI)	70 (high)	68 (high)	80 (high)
Individualism Index (IDV)	46 (collectivist)	71 (Individualist)	38 (collectivist)
Masculinity Index (MAS)	53 (masculine)	43 (feminine)	53 (masculine)
Uncertainty Avoidance Index (UAI)	68 (strong)	86 (strong)	68 (strong)
Long-Term Orientation (LTO)	Africa, especially sub-Saharan = Short Term (index not reported)	39 (higher or long-term; based on replication of data)	Fundamentalists, especially Muslim fundamentalists, = Short Term

Compiled from Hofstede, G., & Hofstede, G. J. (2005). Cultures and organizations. New York: McGraw Hill. pp. 43, 78-79, 121, 168-169, 211, 233-237.

6.2.2. Moroccan Web design

One method of evaluating cultural affinity for interface design has been established through the analysis of existing national Web pages (Barber & Badre, 1998; Marcus and Gould, 2000). By examining the design principles put forth by Marcus and Gould (2000), it is possible to outline characteristics of Web interfaces that could correspond to Hofstede's cultural dimensions for Morocco. A logical second step is to seek confirmation by examining the Moroccan Web. This second step has been undertaken, but the results were inconclusive. The results are reported below, and factors affecting access for Moroccans are discussed throughout this section.

6.2.2.1 Marcus & Gould's design principles for Morocco

Marcus and Gould (2000) expect certain attributes for websites based on the values identified by Hofstede. Based on the results for Morocco for the cultural dimensions listed above, Marcus and Gould expect elements in Moroccan websites to favor cultural markers in specific ways. Not all suggested cultural markers should apply to Morocco, but the ideas put forth can be appraised, and suggested implications for an interface can be put forth.

Power Distance Index (PDI)

Morocco has a Large Power Distance; therefore Marcus and Gould expect:

- Highly structured access to information
- Tall hierarchies in mental models
- Significant/frequent use or emphasis on the social and moral order (e.g., nationalism or religion) and its symbols
- Strong focus on expertise, authority, experts, certifications, official stamps, or logos
- Prominence given to leaders
- Explicit, enforced, frequent restrictions on users emphasizing the importance of security and restrictions or barriers to access

- Frequent use of social roles to organize information (e.g., a managers' section obvious to all but sealed off from non-managers)

To capitalize on the Power Distance Index in a CHDL for Morocco, images of religion, including mosques and images of traditionally dressed Moroccans should be abundant in Moroccan interfaces. An image of the king, the national flag, and the outline of the country would also be appropriate. Because red and green are the colors of the flag, these colors could be accentuated in the interface. Any tutorials should picture non-literate citizens struggling to succeed at using the CHDL; the demographic should match as closely as possible the demographic of target users as a way of making clear to users that the CHDL is designed for them.

One study on cross-cultural usability of icons from institutes of higher learning in the United States asked Moroccan subjects to select one image of a professor from among three images. Moroccan subjects chose the most professionally dressed woman of the three. It is perceived that they did this because of the high power distance in Morocco and the Moroccan professor's status as "almost as a God" (Knight, Gunawardena, Bouachrine, Dassanayake, Gnanakumar, & Kulasuriya, 2006, p. 143). The godlike stature of people in power should be used to demonstrate that the CHDL is for everyone else.

Individualism Index (IDV)

Morocco has a Collectivist national culture; therefore Marcus and Gould expect:

- Motivation based on group achievement: personal achievement underplayed
- Images of success demonstrated through achievement of social-political agendas
- Rhetorical style including official slogans and subdued hyperbole and controversy
- Prominence given to aged, experienced, wise leaders and states of being
- Importance given products shown by themselves or with groups
- Underlying sense of social morality and emphasis on relationships
- Emphasis not on change, but on tradition and history
- Protection of personal data, differentiating the individual from the group

The collectivist character of the Moroccan national culture may mean that individuals will hesitate to use the CHDL alone. If possible, stations should be made to allow for entirely collaborative access to content. Featured content could promote documents that show older community members and that address questions of tradition and history.

Morocco's IDV can be seen to affect approaches to access and selection of content more directly than the look and feel of the interface itself. This assumption is confirmed in Duncker's (2002) description of Māori use of library resources, both electronic and physical. Members of collectivist cultures will be "mentally programmed" to be comfortable when there are members of the in-group with them. This comfort in groups and focus away from the individual is in contrast with the Western emphasis on individualism, on the solo use of libraries and solitary act of reading, and the focus on the education of the individual. When possible, use of the CHDL should encourage group interaction, collaboration, and exploitation of a culture's oral traditions. The read/write Web encourages compatible interactions and should be investigated for future implementation.

Masculinity Index (MAS)

Morocco is a Masculine country; therefore Marcus and Gould expect:

- Traditional gender/family/age distinctions.
- Work tasks, roles, and mastery, with quick results for limited tasks
- Navigation oriented to exploration and control
- Attention gained through games and competitions
- Graphics, sound, and animation used for utilitarian purposes

Masculine approaches to interface design will manifest themselves primarily in the navigational structure. The flat structure requiring few clicks will provide fast access to materials in accordance with the suggestions. Browsing will permit exploration; backtracking will not be necessary once the first search has been launched. In an effort to streamline the experience, reduce required bandwidth, and eliminate frustrations, extraneous visuals and sounds will not be used.

In the creation of tutorials, games may be a good way to instruct users. Hofstede and Hofstede (2005) describe education in Masculine countries as promoting competition between students and as rewarding the best, as opposed to encouraging the weakest, students. This kind of in-group competition could be invoked in the creation of tutorials. It could also be incorporated in a layered interface structure, where users would able to unlock new levels of functionalities as they progress in their interactions with the CHDL, becoming more sophisticated and acquiring increasing computer literacy as they advance. Individual or group-based logins would permit this kind of benchmarking of progress though the functionalities.

Uncertainty Avoidance Index (UAI)

Morocco has a Strong Uncertainty Avoidance; therefore Marcus and Gould expect:

- Simplicity, with clear metaphors, limited choices, and restricted amounts of data
- Attempts to reveal or forecast the results or implications of actions before users act
- Navigation schemes intended to prevent users from becoming lost
- Mental models and help systems that focus on reducing "user errors."
- Redundant cues (color, typography, sound, etc.) to reduce ambiguity

The elements listed above are design elements that logically would be implemented in many situations where novice users will be interacting with a new system. These design elements are endorsed. Additional aspects of a Strong Uncertainty Avoidance will be incorporated in the tutorial and in the call to authorities or experts to demonstrate that non-literate users truly are the intended users of the CHDL.

Long-Term Orientation (LTO)

Morocco's culture is one of Short Term Orientation; therefore Marcus and Gould expect:

- Content focused on truth and certainty of beliefs.
- Rules as a source of information and credibility.
- Desire for immediate results and achievement of goals.

The interface should take advantage of the analytical thinking demonstrated by people from a culture with a Short Term Orientation. Synthetic thinking need not be required. Care might be taken at first to encourage confirmation of content in the database since cognitive consistency is valued over disagreement (Hofstede & Hofstede, 2005).

6.2.2.2. Analysis of the Moroccan Web

Morocco is the third country in Africa in terms of Internet users. There are 6,600,000 Internet users in this country of 34,343,219; a full 19.2 percent of the population is online (Internet Usage Statistics, 2009). Compared to developed countries in North America and Europe, this is a small percentage. Morocco, with nearly 20 percent Internet penetration, has been successful in getting a large percentage of the population online, and this despite problems of poverty. Given that the population in

Morocco is 50 percent illiterate (CIA World Factbook, 2009), the percentage of users is

very high, and may not only include citizens who are literate.

Investigating the Moroccan Web that has spontaneously developed was deemed

the best way to begin to understand interface needs of Moroccan users who are literate

and educated. The analysis of their Web pages would serve to inform the creation of

interfaces for non-literate countrymen. In light of the large percentage of Moroccans

online, the following hypotheses emerged:

> **H1** Languages in use on the Moroccan Web will reflect the languages in use by
> educated Moroccans.
>
> **H2**. "Top" Moroccan Web pages in the .gov.ma domain will provide insight into
> cultural markers important in Morocco.
>
> **H3**. "Top" Moroccan Web pages in the .gov.ma will demonstrate characteristics
> consistent with Marcus and Gould's expectations.

It is not possible to know with certainty why Moroccan users go online or what

kinds of sites they enjoy visiting. Further, it is not known whether Moroccans use only

Moroccan sites or if they visit sites from other countries. Websites in the .ma domain and

Moroccan government sites represent two groups of sites likely to exhibit typical

Moroccan Web design characteristics and will be examined here briefly.

A preliminary analysis of Moroccan Websites in general and government

Websites in particular was undertaken in January 2009. The purpose of these

observations was to explore the characteristics of the Moroccan Web as a tool for literate

users based on H1, H2, and to a lesser extent, H3. Inferences could potentially be made

about Moroccans preferences if a Moroccan Web could be identified. Searches were

carried out in Morocco using the search engine Google. The location of the searches is

significant since the rank or even the results may differ depending on the physical

location of the computer launching the search (Currall & Moss, 2008). The operating

system of the computer was set to American English and the browser language was set to French. These settings, likewise, may have influenced the results reported below.

6.2.2.3 Brief survey of the Moroccan Web

By identifying themselves as being in a Moroccan domain (.ma at the end of the homepage's Web address), institutions that choose to have a Moroccan URL are intentionally aligning themselves with the country of Morocco. Through the Google search engine, it is possible to restrict searches to a domain using the "site:.ma" operator. Although restricting to the .ma domain in Google will not identify every Web site hosted on Moroccan Web servers, it will identify a certain number of them. Moroccan Web sites that have chosen .com or .net domains will not be considered in this research.

Search engines offer results by language. Google permits limiting by language in the advanced search interface. Because Arabic, French, and English are the international languages most widely used in Morocco, these languages were used in different Google queries of the .ma domain from the advanced search screen. The total numbers of Web pages for each of the three major languages appear in Table 6-4. French has the most pages, followed by Arabic. There are considerably fewer English-language pages according to the Google results.

Table 6-4: Moroccan Web Pages.

DOMAIN/LANGUAGE	NO. OF PAGES	% OF RESULTS IN LANGUAGE
site:.ma/Arabic	1 850 000	90%
site:.ma/French	2 910 000	100%
site:.ma/English	302 000	25%
Total for languages	5 062 000	
site:.ma (no language specified)	4 400 000	

Searches carried out January 27, 2009 using the Google.com search engine from a Moroccan IP address.

These results imply that Google considers certain pages to be bilingual or even, perhaps, multilingual since the three languages together have more pages attributed to

them than there are pages in the Moroccan domain. A certain amount of overlap and

inconsistencies are reported in the Google results by language. Results were then

manually inspected. The first 20 hits in English, when manually inspected, only contain

five pages in English. The rest of the pages are in French, or would not display either

actively or in versions cached by Google. Further, four of the results on the English list

were in French and were ranked highly on the French list as well. Eighteen of the first 20

pages in Arabic were written in Arabic, and all 20 of the French pages were in French. If

only 25 percent of the English results actually were in English based on the rough

estimate after looking at the first 20 pages, and if 90 percent of Arabic results actually

were in Arabic using the same logic, a new graph that more closely approximates the

number of pages attributed to the .ma domain can be generated. See Table 6-5 for the

recalculated estimate and the percentages.

Table 6-5: Recalculated Estimate of Moroccan Web pages

LANGUAGE	RECALCULATED PAGE # ESTIMATE	% OF .MA WEB
Arabic	1,665,000	35.8
English	75,500	1.6
French	2,910,000	62.6
Total pages	4,650,500	100

Searches carried out January 27, 2009 using the Google.com search engine from a Moroccan IP address.

These initial results were in line with expectations based on the literacy patterns

of educated Moroccans. Most educated Moroccans are comfortable in French, with a

small percentage also comfortable in English. These are the two languages of commerce,

so it is not surprising to find them in use on the Moroccan Web. Because Standard Arabic

is the official language of Morocco, it is also not surprising to find over a third of the

Moroccan Web written in Arabic. To investigate a deep localization that makes use of

cultural markers important to average Moroccans, official pages, presumably written in

Arabic, will be investigated next.

6.2.2.4 Brief survey of Moroccan government Web pages

Because there is effectively no ecommerce in Morocco and because the development of the Moroccan Web is currently limited, Government Web pages were chosen as the most representative pages of the domain. It is possible to compile a list of the most highly ranked Web pages published by the Moroccan government. This can be done by restricting a search to the .gov.ma domain. Google will return results in a ranked order based on its secret PageRank algorithm. Although there is no way to know exactly what criteria make a page fall within the first hits in a Google search, for the purpose of this survey, we will assume that the Google ranking is as good as any for compiling a list of "top" Moroccan government sites.

The first 5 pages of Google results were examined manually for language. There are 10 results to a page, but one of the results carried a threat of Malware. Therefore, the top 49 Google hits were retained for investigation. The official site of the Moroccan government was added to the retained pages, as it curiously does not have .gov in the URL (www.maroc.ma) and was not retrieved in the basic search. This brought the number of pages investigated to 50.

Of the top 50 Moroccan government Web pages examined, a startling 16 were not functioning. Because the snippet offered by Google and the title of the Web page were often in different languages, it was difficult to tell which language might have been used in the body of the pages when they were live. When possible, pages were searched in the Internet Archives's *Way Back Machine* (http://www.archive.org/web/web.php) to ascertain the language that had been used primarily. Of the top 50, a total of 34 Web pages were in French or mostly in French, and 12 were in Arabic or mostly in Arabic. For four of the sites, it was still impossible after consulting the *Way Back Machine* to know for certain

the language that had been in use, either because the *Way Back Machine* had not recorded the pages or because it could not pull up the results for some reason. Almost three times as many of the top ranked pages were in French as in Arabic, and none defaulted to English. See Table 6-6 for a graphic representation.

Table 6-6: "Top" Moroccan Government Web pages, by language

"TOP" MOROCCAN GOVERNMENT WEB PAGES, BY LANGUAGE	NUMBER OF PAGES	PERCENTAGE OF "TOP" PAGES
Arabic (official language)	12	24%
French (working language)	34	68%
English (international language)	0	0%
Not ascertainable	4	8%
Total	50	100%

Searches carried out January 27, 2009 using the Google.com search engine from a Moroccan IP address and verifying pages in the Internet Archives's *Way Back Machine*.

The *Way Back Machine* provides a list of every capture it has for a site. In the case of the 50 top Moroccan government sites, the *Way Back Machine* had some kind of information on 35 of them. Roughly half of these, or 17 pages, were online before the end of 2002. It would be interesting to know how much maintenance the pages have received since that time, as many did not seem to have the look and feel of post-Web 2.0 pages. Several of the pages had blinking script, obvious underlying HTML tables, and little in the way of overall design appeal. These pages came from diverse ministries, agencies, and other government bodies. There is little uniformity in the look of the pages or the content, few hyperlinks to other pages, and little work being done to keep the pages up to date. Attempts at recording and comparing the "last updated on" date were hindered because almost none of the pages provided this information.

Although the guidelines proposed by Marcus and Gould have a logical basis, it was not possible to confirm their application on the Moroccan governmental Web. The preliminary analysis of websites indicated that Moroccans use foreign software to create

government websites. Unlike the Brazilians who create government websites that are particularly culturally relevant, Moroccans have not made an attempt to personalize government websites for their culture, metaphors, and national tastes. It is not currently possible to identify uniquely Moroccan elements of Web design based on government WebPages.

6.2.2.5. Hypotheses revisited

Establishing the criteria to identify successful Moroccan websites is difficult. Banking and e-commerce are largely undeveloped in Morocco; institutes of higher education are not numerous. Comparisons such as the ones that have been done in countries with a more developed web presence are not possible in Morocco, and the survey of the Moroccan Web did not yield information that would help in the creation of a Moroccan interface.

In revisiting the hypotheses, some interesting information can be brought forth.

H1 Languages in use on the Moroccan Web will reflect the languages in use by educated Moroccans.

This hypothesis was confirmed. Google seems to expect that users will want to access pages in Arabic, and the default search screen from Morocco is a right-to-left search box. Morocco claims to be interested in cultivating business relations with the West, but has truly only opened itself to a French-speaking world.

H2. "Top" Moroccan Web pages in the .gov.ma domain will provide insight into cultural markers important in Morocco.

This hypothesis could not be confirmed because of the dead links, abandoned pages, and reliance on foreign-language software for the creation of Web pages. These results are interesting in the way that the Moroccan Web can be inferred to be an

unimportant or unvalued means of communication between the government and its

people. It is difficult to understand why so many Moroccan government pages use French

when so few of the citizens speak it or read it. The study of the Moroccan government

websites revealed that many of the pages were last updated many years prior. For these

websites, the bandwidth required to view the pages was minimal, enabling older servers,

slower connections, and low-resolution screens on old computers to transmit information

efficiently. A cultural marker may be valuing fast download speeds over updated or new-

looking Web pages.

H3. "Top" Moroccan Web pages in the .gov.ma will demonstrate characteristics
consistent with Marcus and Gould's expectations.

Strictly speaking, this hypothesis cannot be confirmed because the Web pages in

the gov.ma domain did not necessarily display design characteristics mentioned. The

pages that were consulted in the *Way Back Machine* were stripped of most images, but

underlying html that provided for blinking text remained. Blinking text or animations go

against the suggested design elements and against a best-practices implementation of

Hofstede's cultural dimensions.

Seen from another angle, though, the Moroccan government's use of the Web

could be said to respond to some expectations based on cultural values. The Strong

Uncertainty Avoidance in Moroccan culture "programs" Moroccans to hesitate in the use

of new technologies. For this reason, it would not be expected that anyone other than the

most educated would be accessing the Internet or using the Web pages created by the

government. No provision for access was made for the uneducated, as expected based on

the Large Power Distance. The Web may be considered a tool for an educated elite; this

attitude should be confirmed later and may need to be taken into account when implementing design decisions.

6.2.3. Cultural challenges to access

The culture of Morocco, a North African country, is very different from the cultures studied in standard universal usability projects. Past studies on culture and computer interfaces focus primarily on Asia. Although Morocco has some of the highest rates of broadband access in all of Africa, there is still a great deal of illiteracy. Illiterate citizens are more likely to live in rural settings. Broadband penetration is generally considered to be highest in urban areas of the country, corroborating to an extent the tentative conclusions to the study of the Web from the previous section.

6.2.3.1. The Library metaphor applied

Morocco has a long tradition of scholarship and libraries that includes both Muslim and Western influences. Indeed, this research in no way implies that Moroccans do not acknowledge the value of information, learning, and libraries. However, the tradition of democratic access to information is primarily part of the Western tradition and may not be understood in Moroccan culture in the same way. The notion of library as exclusive and restricted areas corresponds with traditional Moroccan notions of archives and libraries as being places of study for scholars. Having been introduced by the French to the elites of Moroccan society, the modern library metaphor may be foreign to Moroccan citizens who are not educated in the French tradition. Moroccan libraries are making strides toward increasing access through projects like the new public library building in Casablanca. In many parts of the country, however, libraries cannot be said to be purveyors of basic information for the general populace since they will tend to appeal

to the literate. In a culture programmed to value oral traditions and the collectivity, it is not expected to find a model of libraries that is adapted for and embraced by all citizens.

6.2.3.2. Libraries in Morocco: implementing an information policy

Libraries are familiar institutions for the educated, but will not be familiar to poor and illiterate citizens. Information policy can be described as "a set of decisions, endorsed at the highest government level, oriented toward the coordinated development of information services and systems" (Wesley, 1989, 24). Moroccan information policy can be seen as promoting in a limited manner libraries and the knowledge they hold at the national level, but as seen before, implementation of democratic access through the Web has not yet been accomplished.

6.2.3.3. The Muslim tradition

Morocco has a history of special libraries that predates its colonial period by hundreds of years. The three francophone countries of North Africa have civilizations based on written texts (Lajeunesse & Sène, 2004, p. 369) and are often grouped with other Muslim countries located in the Middle East rather than being grouped with closer African countries that share their colonial heritage but not their religious affinity for religious scholarship. Muslim scribes have been creating manuscripts in Arabic since the 900s (Hover, 2007). Libraries of almost all types were established throughout the Islamic empire during the rise of the Islamic civilization (Dyab, 2002) The single comprehensive work in French on the libraries of Morocco was published as a volume in the series entitled *Islam d'hier et d'aujourd'hui* (Islam of yesterday and today), demonstrating the

importance of the special library and the conservation of the written word in Islam.[13]

Muslim scholars are proud of the longstanding tradition of books that is part of the

Moroccan culture. The culture of writing is important in Islamic countries, as it served as

a fundamental part of the religion. Storage for these documents was essential, and the

creation of private libraries was an important but little-documented phenomenon in

Morocco (Benjelloun-Laroui, 1992, p. 301). In 1990, hundreds of libraries existed in

Morocco (p. 15). Special and personal libraries kept for religious reasons likely

composed the bulk of these Moroccan libraries.

6.2.3.1.1 Colonial influences

Libraries in the Western sense were introduced by the colonizers in the late 19th

and early 20th centuries. Libraries in these countries were not meant to support

information needs of an empowered democracy or to foster learning for the masses.

Instead, they were meant "to serve the leisure and cultural needs of the settlers" (Ocholla,

2000, p. 34). In doing so, they supported the needs the French, not of the local people. All

three North African Maghrebi countries that are former French colonies have national

libraries dating from the time of colonization (Lajeunesse & Sène, 2004).

At the time of independence, Western libraries in the North African francophone

countries were overlooked by their new governments. "Libraries, documentation services

and archives, which were not well developed at the time and which were considered

secondary and unproductive services in the predominantly oral societies, were ignored by

decision makers and planners" (Lajeunesse & Sène, 2004, p. 369). Libraries in French-

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[13] The definitive book by Benjelloun-Laroui is out of print, but still was available in specialty bookshops in Rabat and online: Benjelloun-Laroui, L. (1990). *Les bibliothèques au Maroc* (Vol. 34). Paris: Maisonneuve et Larose.

speaking Africa were less developed than libraries in Anglophone Africa by comparison (Lajeunesse & Sène, 1984, p. 272). The focus away from libraries has continued through to the present. Current statistics have been compiled by the OCLC Library and are displayed below in Table 6-7. North African countries are considered to be part of the Middle East in the statistics given. When considering all kinds of libraries combined (academic, public, school, special, and national), there are nearly 80,000 libraries in the Middle East and North Africa, and fewer than 5,000 libraries in all of Sub-Saharan Africa. Sub-Saharan Africa has the lowest number of libraries of any region studied. Canada has about 35 million inhabitants and South Africa about 50 million[14], yet Canada has almost 50% more academic libraries, more than twice as many public libraries, more than three times as many school libraries, and nearly three times as many special libraries as all Sub-Saharan African countries, including South Africa, combined. See Table 6-7 for a comprehensive breakdown of types of libraries by region.

Table 6-7: World Libraries 2009, by Region (Olszewski, 2009)

REGION	ACADEMIC	PUBLIC	SCHOOL	SPECIAL	NATIONAL	TOTAL
Sub-Saharan Africa	435	1,294	1,888	1,185	40	4,842
Asia Pacific Rim	14,183	87,810	455,653	18,306	38	575,990
Canada	659	3,235	6,390	3,449	2	13,735
Europe	8,539	115,594	190,842	26,791	54	341,820
Latin America	3,135	15,273	32,488	2,336	27	53,259
Middle East and N. Africa	1,103	11,191	58,417	8,642	19	79,372
United States	3,617	9,208	93,861	9,066	4	115,756
TOTAL	31,671	243,605	839,539	69,775	184	1,184,774

Table translated from the French.

[14] South Africa 49,052,489 (July 2009 est.) https://www.cia.gov/library/publications/the-world-factbook/geos/sf.html and Canada 33,487,208 (July 2009 est.) https://www.cia.gov/library/publications/the-world-factbook/geos/ca.html

Lajeunesse & Sène (2004) report that national libraries in French-speaking African countries have difficulty operating because of the small budgets they receive. Table 6-8 demonstrates that, although Sub-Saharan African budgets may be small, they are more generous per library than some of the other regions listed. The table above demonstrates that there are many more libraries in the Middle East and North Africa than in Sub-Saharan Africa. The 435 academic libraries in Sub-Saharan Africa spend 56 million US dollars (USD) annually. This averages out to 128,736 USD per academic library per year. There are 1,103 academic libraries in the Middle East that spend 42 million USD annually. This averages out to 38,078 USD per academic library per year in the Middle East, in a culture that does not have a strong tradition of universities or higher education. African academic libraries, although relatively few, on average spend more than three times as much as Middle Eastern academic libraries annually. Budgets for Sub-Saharan African academic libraries are likewise larger than ones for academic libraries in Asia/Pacific Rim, where academic libraries spend on average spend 107,594 USD annually. Unsurprisingly, countries with a strong tradition of literacy spend more on libraries on average. In Europe, the average spending for an academic library is around 310,000 USD per library per year, in Canada, 834,598 USD per year, and in the United States, 1,723,527 USD per year. Compared to European and Anglophone regions, Sub-Saharan Africa is not well-funded, but compared to other regions that do not have a strong tradition of reading, Sub-Saharan Africa is actually ahead in terms of spending per academic library.

Table 6-8: Spending by world Libraries 2009, in Millions of US Dollars Annually, by Region (Olszewski. 2009)

REGION	ACADEMIC	PUBLIC	SCHOOL	SPECIAL	NATIONAL	TOTAL
Sub-Saharan Africa	56	483	7	12	6	564

Asia Pacific Rim	1,526	2,152	394	1,286	338	5,696
Canada	550	290	62	323	21	1,246
Europe	2,647	6,434	1,249	3,002	753	14,085
Latin America	124	68	82	56	12	342
Middle East and N. Africa	42	544	232	38	17	873
United States	6,234	9,596	598	2,121	923	19,472
TOTAL	11,179	19,567	2,624	6,838	2,070	42,278

Table translated from the French.

6.2.3.1.2 Morocco's national libraries

Morocco had libraries in Rabat and Tétouan from the time of the French and Spanish protectorates; both were called "general" libraries instead of "national" libraries, as the word "national" would have been subversive under the circumstances (Benjelloun-Laroui, 1990, pp. 9-10). The library in the capital city of Rabat came to be known as the official General Library; responsibility for the State's archives was added later. A Royal Decree from 1931 put public libraries administratively under the General Library (Lajeunesse & Sène, 2004, p. 369). The General Library and Archives became the de facto national library for Morocco until the time in 2008 when it moved to a new building and officially became the National Library of the Kingdom of Morocco (Bibliothèque Nationale du Royaume du Maroc, or BNRM). It is the BNRM that takes care of work that is book-related, including running the National Deposit and creating a National Bibliography; it is financially autonomous (Lajeunesse, 2008). The BNRM also maintains collections of new media and houses archives. Services are available for patrons, including scanning repaired manuscripts for study. See Figure 6-1 below.

Figure 6-1: A) Media room and B) Manuscripts repair area, both in Morocco's new BNRM.

Not a national library, the National Documentation Center (Centre National de Documentation, or CND) is also located in Rabat. Because of its national-level activities, the CND will be considered in this section on national libraries. The CND was created in 1968 with the help of the FAO, the Food and Agriculture Organization of the United Nations (Benjelloun-Laroui, 1990, p. 7); the King supported the CND from the beginning, and put one of his relatives in charge of the development of the center (Wesley, 1989, p. 33). An ambitious set of functions was laid out in formal legislation in 1980 and 1981 (Wesley, 1989, p. 24). While the BNRM primarily works with published materials, the CND works with grey literature, including documents from government ministries. It also collects and organizes Web resources of interest in the social sciences. The CND, like the School of Information Science (ESI), is under the Ministry of Planning; the documentation center is also an OCLC member library (OCLC, 2008).

Figure 6-2: A) An Employee Standing with Printing Equipment and B) the Server Room, both at Morocco's CND in Rabat.

In a 1989 comparison to other national library structures in the Arab world, Morocco showed itself one of the leaders: Morocco was one of seven (of fifteen) Arab countries with a national library, one of seven publishing a national bibliography (and one of 4 publishing it at intervals throughout the year), one of five countries with a union list of serials (the only one to maintain this list in machine-readable form), and one of three countries to have made progress on indexing and abstracting databases. Morocco did not have a union catalog; only three institutions in Bahrain were collaborating to create a union catalog (Rehman, 1989). Rehman concludes that "national information infrastructures of these countries are underdeveloped and the efforts for planning and development are largely incoherent and poorly designed" (1989, p. 461). This comparative study was carried out toward the end of the reign of the now deceased King Hassan II. Morocco's new king, Mohammed VI, authorized the construction of the new National Library of the Kingdom of Morocco building that he inaugurated in October 2008. According to the library website as the building was being finished, the new structure was deemed part of the cultural infrastructure of the country and essential to

Morocco's development (Bibliothèque Nationale du Royaume du Maroc, 2008b). The new Moroccan commitment to libraries and learning is evident in this new and ambitious building project. Already in 1990, when comparing Morocco to other North African countries, it was possible to conclude that "Morocco has the basic requirements for laying down and implementing the information policy" (Wesley, 1989, p. 25-26).

Research libraries

Moroccan libraries and archives are increasingly able to serve scholars in diverse fields. University libraries were identified as institutions to benefit from the education reform (Erhif & Belmekki, 2007), several research libraries and collections of archives are available throughout the country for use by researchers, including foreign ones with the proper government-sponsored research permit (MACECE, 2008), and digitization projects are underway at the CND and the BNRM (Bibliothèque Nationale du Royaume du Maroc, 2008b). Documents pertaining to national heritage, especially fragile or unique and rare documents are being scanned as part of the BNRM's digitization project; such steps will protect the cultural heritage materials for future use and study.

6.2.3.1.3 Librarianship in Morocco

The tradition of libraries and a sound basis to professional librarianship were not developed in the Arab world (Rehman, 1989, p. 461) and librarianship has suffered as a result. The points of similarity between Western notions of library and Moroccan notions are few. The American Library Association's *Library Bill of Rights* dates from 1948. The third and fourth paragraphs state, "Libraries should cooperate with all persons and groups concerned with resisting abridgment of free expression and free access to ideas. A person's right to use a library should not be denied or abridged because of origin, age,

background, or views" (American Library Association, 2009). We can compare this to Benjelloun-Laroui's discussion of access in Morocco:

> *La bibliothèque est un camp retranché où personne ne pénètre ; si elle est une pièce attenante à une autre salle, à une mosquée (les mosquées ne contenaient pas seulement des ouvrages religieux, mais aussi des livres scientifiques et philosophiques, surtout quand elles ouvraient leur portes aux étudiants en tant qu'universités), à une médersa, une zaouia, un sanctuaire, elle est interdite à tout étranger"* (Benjelloun-Laroui, 1990, p. 301-302[15]).

In the American tradition, libraries are places of knowledge inexorably linked to the strengthening of the democracy through the empowerment of the individual. The Moroccan tradition could be described as a polar opposite: libraries and the knowledge they contain are reserved for a privileged few, normally to improve their understanding of religious works to the exclusion of secular influences.

In the West and parts of the East, traditions of libraries and professional librarianship favor use of materials, and increasingly, access by users. It was Ranganathan the Indian librarian who advanced the Five Laws of Library Science (1931), espousing ideals of use, growth and access. In Morocco, the tradition of books favors their protection at the expense of their access and use. Accordingly, the profession of librarian in Morocco can lack clout; information professionals may prefer to align themselves with the profession of documentalist and are surprised when Americans state that librarianship is a profession that is advancing rapidly. For information professionals in Morocco, librarianship is a profession that is entirely static (M. Rachik, personal

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[15] Libraries are protected strongholds to which no one gains entry; even when the library adjoins another room, a mosque (mosques did not only contain religious works, but also scientific and philosophical books, especially when the mosques opened their doors to students as universities), a madrasah, a zaouia, or a sanctuary, no outsiders are permitted.

communication, May 23, 2009). The education of information professionals in and from this culture may reinforce the perceived stagnancy of the field.

6.2.3.1.4 Library and Information Science education

Morocco boasts one of the best library and information science schools in Africa, the *École des Sciences de l'Information* (ESI). This *grande école* is known for its good building and computer equipment (Dyab, 2002). Founded in 1974, ESI is a school of higher education, but is unaffiliated with the traditional universities located in Rabat; ESI is under the Ministry of Planning (Haut Commissariat au Plan, 2008), not under the Ministry of Education (Dyab, 2002, p. 63). It employs a well-credentialed group of instructors who have developed and maintain strong international connections. Students can receive both undergraduate and graduate diplomas from ESI. Undergraduates earn a four-year bachelors degree; non-specialists who already possess a bachelors in another discipline along with graduates of ESI's undergraduate program earn a master's from ESI (Haut Commissariat au Plan, 2008). As of the 2009/2010 academic year, the school's director has expressed the intention to keep the undergraduate degree a four-year degree instead of moving to align with other Moroccan schools which offer an undergraduate degree in three years (Djigo, 2009). A doctoral degree will be offered at ESI in the near future (H. Lemallem, personal communication, October 2009).

Information specialists are an important part of access to information, and must have specialized training to serve patrons effectively. As the Anglo- library world did before the popularity of online computer systems (i.e. Shera & Egan, 1953), and as many countries still do today, Moroccan society distinguishes between the professions of documentalists and librarians. To simplify the distinction, documentalists have dealings with documents, and librarians with books. The curriculum emphasizes computer

technology to assist documentalists in their work, and teaches only non-computerized methods of organization and access to library materials, reinforcing the stereotypes of relative modernity in the field of documentalism. In Morocco, the education and preparation for both professions takes place at the same institution of higher education, in the combined training for what is termed *informatistes*. *Informatiste* is a term that is unique to Morocco in francophone library science education. The two traditional professional terms of librarian and documentalist are considered together along with the Moroccan hybrid term because of the unity of the practitioners' educational background and resulting professional work; I use the term librarian as a generic term to designate information professionals, as is the current custom in LIS studies in the United States.

6.2.4. Technical challenges to access to information

According to Mutula (2007), the evolving information environment in African countries described earlier in this chapter is creating a need for a corresponding paradigm shift in libraries: access to information must adapt to electronic media. In the face of the inequalities in terms of access to online information that is present in their country, Moroccan librarians, like librarians the world over, must work as "information facilitators in today's information age" (Mutula, 2007, p. 397). Not only must they understand how best to provide information to a partially illiterate society, they may find that they are meant to carry out their craft in a language that is not their mother tongue, nor in a language spoken by the information seeker. Library school programs in developing countries need to create a curriculum able to "balance the requirements for the global trends with the immediate environment" (Aina, 2005, p. 168). As information changes in developing countries and as populations respond, librarians must be ready to meet the needs of modern patrons. One suggestion is to prepare librarians to work with patrons

who are illiterate, especially rural and slum-dwelling populations. If African libraries are to be successful, they cannot pattern themselves on a Western model that we have shown is not their own. Provisioning information literacy to non-literate users should be one goal; documenting indigenous knowledge should be another (Aina, 2005).

Librarians are in a position to use technology in their libraries as a way of responding to the paradigm shift. Mutula (2007) describes how libraries are cataloging and classifying Internet resources for inclusion in the online public access catalog (OPAC). In this way, the OPAC provides access as a far-reaching gateway to information, not as a simple automated shelf list. Although focusing on efforts to Least Developed Countries (LDC) in Africa, Corrado (2007) describes a series of initiatives that are underway to encourage access to digital information in African libraries. The use of open source software and open access has been suggested by many (Corrado, 2007; Mutula, 2007, etc.) as a means of providing materials to users in Africa. Projects like the E-Granary Digital Library from the University of Iowa and the International Development Research Centre of Canada's Connectivity Africa are designed to assist developing countries in Africa in acquiring access to resources.

Evidence exists based on the information policy and the evolving attitudes toward libraries, information professionals, and information that Morocco is getting more comfortable with allowing a Western approach to information access. The current time may be right to suggest a CHDL for non-literate users and to introduce such a system into the official structure. In order to suggest such an undertaking, particularities of the system must be assessed and described.

6.3. CAMEL: Proposed Synthesis of Cultural Usability and Systems Aspects

The CHDL that could be localized for Morocco could be called the Cooperative American Moroccan Electronic Library (CAMEL). The camel is an animal positively viewed in Moroccan culture; it is admired for its hardiness in the desert. It is also a practical animal which can be used for nourishment in the form of meat and milk. Camel bones can be dyed with henna and used as adornments on mirrors, decorative boxes, and other traditional crafts. Traditional attachment to the camel, the recognizableness of camel-related products, and the feeling of ownership of the camel are themes that will surface in the application of the design framework to the Moroccan CHDL CAMEL.

By working with scholars interested in cultural aspects of Morocco, it is possible to assemble a collection of audio-visual documents on topics relevant to Moroccan cultural heritage that could, by virtue of the kind of files, be accessible by illiterate Moroccans. The initial files to be included in the pilot were created by American researchers who were awarded United States Department of State-sponsored Fulbright grants to Morocco. For this reason, the Moroccan digital library of cultural heritage files is known as the Cooperative American-Moroccan Electronic Library (CAMEL).

CAMEL would offer an interface to a CHDL for non-literate Moroccans; researchers from the world over may also be interested in access to these documents through a scholarly database interface. For this reason, the fullest metadata possible should be included in each record. To facilitate the accurate (correct) and culturally relevant terms, researchers contributing documents to the CHDL will be requested to provide metadata. Not unlike author-supplied keywords, these terms will become part of

the metadata. Full subject analysis of all included documents in the CHDL should always be carried out. This step is important for two reasons. Subject analysis will provide text based access for researchers who want to retrieve their own data or the data of others doing similar projects. Non literate users will not be using the digital library in the same way and will not need nor have access to a robust index. Instead, non-literate users will launch a query based on one of four facets. The system must be robust enough to map text-based index terms to terms for concepts in related languages. It must also map selected indexed terms to the pictorial access point available in the non-literate user interface. Whenever possible, at least one term should be designated for each content-related index.

6.3.1. System aspects

Working initially within the limitations of the open source software identified, Greenstone and WordPress, the following implementations are suggested. The implementations recommended do not require significant reworking of the database housing CAMEL, but will require some manipulation of the WordPress interface.

6.3.1.1. Organizational aspects

The greatest challenge for information organization in CAMEL would be the creation of controlled heading terms that describe the *aboutness* of the documents and that can be depicted as an icon. Because of the small size of the test corpus, a full thesaurus of descriptors was not created. As CAMEL progresses, it is recommended that the thesaurus developed and maintained by the library of the *Fondation du Roi Abdul Aziz Al Saoud pour les Etudes islamiques et les Sciences humaines* be adopted. This thesaurus was created by a staff member at the Foundation Library and is available online through the Foundation Library's Web site and includes both French and Standard Arabic

translations of terms relevant to the social sciences in the Western Islamic world. Librarians at the Foundation Library made a print version of the thesaurus available; the print version is out of print, but is now photocopiable by arrangement with Foundation Library employees.

6.3.1.2. Retrieval aspects

Queries launching a browse, that can be restricted, are the primary way that non-literate Moroccans will be querying CAMEL. Researchers will want a full-featured DL interface, and will want to be able to search in more complex metadata. Based on the terms used in the Foundation thesaurus, translations, transliterations, and alternate spellings for subjects, places, and people will be grouped together in authority records, which, ideally will be queried along with the records when a researcher-driven search is launched through a researcher interface.

6.3.2. Mental models and localization

To localize the CHDL, an accurate mental model of Moroccan users needs to be created. Returning to the work of Marcus and Gould, we can begin to base some culture-based expectations of the users on the cultural dimensions described by Hofstede. A mockup of an interface was created as a proof of concept. This mockup of the CAMEL interface will serve as a test bed for the application of the theories and frameworks set forth in the previous chapter. A mockup of a prototype was created as a proof of concept that would lead to the creation of a working pilot for CAMEL. Creating an interface prototype may begin with a user requirement study (c.f. Petrie, Morley McNally, O'Neill, and Majoe, 1997). Deo et al. felt that it was impractical to involve illiterate users from developing countries in usability testing of the prototype for their system. Gaining access to such a user group is not always feasible for the purpose of interface study. These

researchers substituted by locating a local group of users who share some of the salient

characteristics of the target user groups (Deo et al., 2004, p. 4).
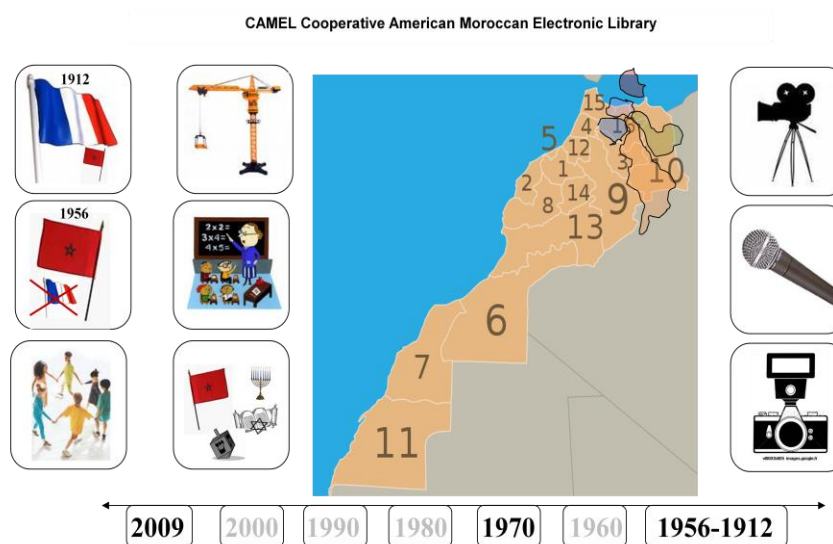
Figure 6-3: Revised Version of CAMEL Mockup.

Approximating the primary user group is not the best way to carry out preliminary

testing of a prototype; principles of usability require that actual users be the focus of

usability testing. Difficulties would be inherent in questioning non-literate users about

their preferences in a system they will never before have used, requiring from them an act

of imagination that seems unreasonable at this point. Further, many users from

developing countries do not understand the principle of usability testing and critique of a

system interface. Western notions of usability and user-friendly design require testing.

Soliciting a response from one or more participants puts a focus on the individual (Smith,

A., et al., 2004). Projects attempting to test usability on individuals from collectivist

cultures like the one in Morocco have not been successful (Duncker, 2002). For these

reasons, user requirement work was carried out through literature reviews and by

listening to Moroccan faculty friends and colleagues when they were talking about their

perceptions of culture. Much insight into requirements was gained during my first

semester in-country when co-teaching the second year course on Information Technology with Mr. Cherkaoui. This co-taught course had an unstated goal of having the two professors highlight cultural differences between the United States and Morocco for students, while teaching students to appreciate their own Morocco culture more strongly as a result; this course served as a great inspiration for reflections on my own research questions. Ideally, once users begin to understand how to use the CHDL, we will be able to follow their usage patterns and understand how to improve on the system once it is in place. This method has its limitations, but the benefit of having a working prototype that adheres to the principles studied and that can be displayed to potential organizational partners outweighs the drawbacks.

The Fulbright teaching award provided me with the opportunity to interact with a variety of Moroccans, not only educated ones, on a daily basis. The literature is largely silent on users from the developing world who work as housekeepers, taxi drivers, and store-keepers. Daily life brought me into regular contact with these people throughout the ten-month grant period, even if I was not able to communicate with them robustly due to language limitations. Reflections on these and other experiences from daily life enriched a study of the literature as I gave thought to interface design problems. Kettani (2005) laid out a framework for GUI interface creation that would meet the needs of "digitally illiterate" and, by extension, functionally illiterate users in Morocco. His list of challenges faced in the creation of an interface is the following:

- Keep it as simple as possible for everybody…
- Semaphores based interaction…
- Step by step form filling…
- Real Forms digitized…
- Touch screen oriented…
- Voice support…

- Uniformity (language and Platte form)…
- Hierarchical menus with categorized information… (Slide 16)

Kettani's project, the eFez Project, like this project, had as a principal goal getting users to information; his challenges, which are interpreted as recommendations, include standard elements of universal usability along with elements that are not well-known at the current time in Morocco like touch-screen systems and audio support. Unlike the current project, the eFez Project involved a very specific information need on the part of the user, and a non-negotiable set of text-based database contents, citizen birth certificates. There was also the option to ask an employee in the office for assistance, thereby bypassing the use of the kiosk entirely.

The need for access and the content that is accessible are taken into account by the designer of the interface. Deo et al. (2004) tried to adapt the content of their DL to non-literate users. Because the planned content of CAMEL relies solely for the moment on the production of American scholars in Morocco, users' relationships with the content is not being considered at this stage. The recommendations in Chapter 7 discuss the way in which including user feedback and input is essential in future work on this CHDL.

6.3.3. Structure and hierarchy

Paper prototypes or mockups were developed for the homepage of the database and were informally and opportunistically discussed with educated Moroccans. Test icons were created based on the intellectual content of the test corpus as part of the process of reflection on the topic; all but one were immediately recognizable by the Moroccans. This led me to believe that my cursory understanding of Moroccan approaches to information was not misguided. Overall friendly reactions to the interface were positive. In light of the culture, there was no expectation or criticism or suggestions.

For the Moroccan interface to CAMEL, the prototype to be tested would have all of the features in a way that is appropriate to the context of Morocco.

6.3.3.1. Look of the interface

The interface will be clean, perhaps with a background made of colorful geometric patterns that have been muted slightly for the purpose of the interface. In Morocco, to be devoid of color or ornamentation is a sign of neglect, making it essential to have some kind of decorative background to the interface. Traditional geometric patterns in tile work are used in religious and architecture. Mosques, riads (private houses that are often guest houses), and hotels may have distinctive tile work. These patterns would carry over well to an interface background. If imagery based on other artisanal work was preferred, it would be possible to use replicas of traditional handcrafts as backgrounds. Patterns for embroideries, pottery, or other familiar handcrafts could be used as backgrounds as well.
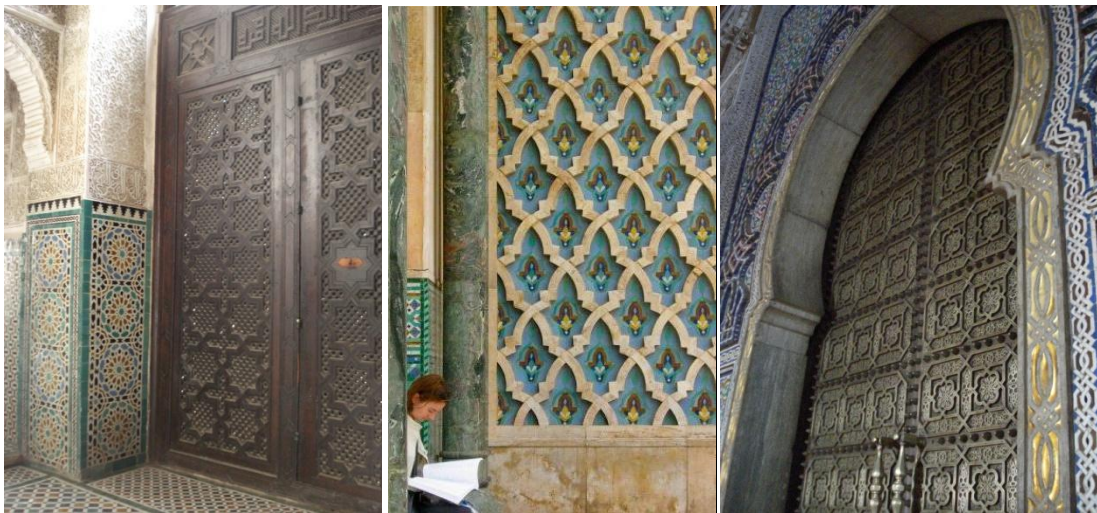
Figure 6-4: Doorways A) in a hotel in Rabat, B) outside of the Grand Mosque in Casablanca, and C) outside of the Mausoleum in Rabat.

Figure 6-5: Patterned Tiles A) and B) from the Grand Mosque in Casablanca and C) from the Mausoleum in Rabat.

Figure 6-6: A) Mirror embellished with camel bones dyed with henna; B) Lanterns for Sale at the Market in Fez; C) wooden tray with Mother of Pearl Inlay.

The suggested use of Moroccan-themed backgrounds for decoration is confirmed in the purely Moroccan interface for the eFez Project. The designers described a participatory method of involving stakeholders in the process from the beginning (Moulin, Kettani, & Elmahdi, n.d.). The eFez Project also attempted to make use of icons (Kettani, 2005, Slide 16).

Figure 6-7: A) Kiosk with user; B) Interface to the eFez Project (Kettani, 2007).

6.3.4. Navigation

Navigation in CAMEL will be consistent with the multicultural navigation described in Chapter 5. There should be quick access to results and a minimum of confusion for users when interacting with the interface.

6.3.5. Hardware

Because Morocco has high Internet penetration, it is advisable to make an interface that users can potentially exploit from the Web using standard computer equipment. Elements of universal design and accessibility are paramount, as many users will have very old computers. Standard for computers includes keyboards.

6.3.6. Visual elements

The visual elements will be buttons as suggested in Chapter 5. These will include topic-based icons, document format icons, a clickable map, and buttons with date ranges. Each type of clickable element including icons, maps, and date ranges, will have the same background color throughout. Subject icons have a yellow background. Format icons have a blue background. Map sections have a brown background. Lastly, date ranges have an orange background. These colors are not meaningful in themselves, but

the repeated use of a certain color creates a pattern that will start to become familiar to CAMEL users.

6.3.6.1. Icons

CAMEL icons are representational and use concrete images when possible to depict the meaning of the access point. The primary characteristics of documents will be the format or the subject, both of which will be represented by icons. Icons made from Microsoft clip art for format and subject were informally tested with a group of Moroccans for suitability. These icons should be further tested and refined to use actual photos if possible. Photos are generally not preferred for icons, as photos might inadvertently contain extraneous information that would mislead users about the query that will be launched (Medhi, Prasad, & Toyama, 2007).

Cultural meaning for icons may be difficult to ascertain for designers who are outside of the culture. Deeply held religious beliefs may be more prevalent in non-literate users than in the bilingual urban Moroccans who initially provided feedback on the drawing-based icons. If icons appear to look like cartoon renderings or drawings, they may be interpreted as being unholy, thus inappropriate. If icons resemble the icons used for the political parties, there may be confusion as well. Morocco has a large number of political parties, each with a symbol. Symbols include tractors, a human eye, a scale, and a rooster. Political tracts distributed at election time show the symbol for the political party, photos of the candidate, and have very rudimentary explanations in Arabic of how to vote. These tracts often show the party's symbol with an "x" over it, indicating how to cast a vote in favor of the party. Culturally, this system is very different from the system in Western cultures where any type of mark over an image is a rejection of the meaning symbolized.

Figure 6-8: Political Tracts from Morocco Promoting Parties.

Icons are both representational and abstract, what Blattner, Sumikawa, and Greenberg call "semi-abstract" icons (1989, p. 16). Icons representing subjects will depict those subjects and will be grouped together in a given area on the Web page. Icons indicating format are grouped together. To facilitate retrieval, the subjects are limited to eight, each of which is depicted using an icon that is a drawing. There are three non-text based formats that documents can use. The icon for video will approximate the one used on YouTube.

6.3.6.2. Maps

A map of Morocco coming from Google maps or Yahoo! World Explorer or from another online freely available map that has coordinates encoded will permit the geolocalization of documents in the DL. Maps are a legitimate means of providing access in Morocco since non-literate city-dwelling Moroccans will have already been exposed to maps of their country. Laminated maps of Morocco are commonly sold by roving street-vendors for 3 Moroccan Dirhams (MAD; 25¢ USD) or placed on the ground of the

market near the mosque when services let out. Satellite dishes that will receive the country's television channels are visible in the poorest parts of the country including in shanty towns where most of the inhabitants will be illiterate. Therefore, in the case of Morocco, the decision was made to use a map of the country to designate geographic location. The map of Morocco can be made clickable by region. Each region in Morocco has a representative landmark associated with a city. Because the zoning for these regions has changed, there may be some confusion about the borders of a region. Providing a mouse-over of a photo of the landmark aids Moroccans unsure of geographic location with understanding the area designated by the regions on the map.

6.3.6.3. Timeline

The timeline and numbers in Morocco reflect the numbers of the Gregorian calendar, as there is not a tradition of referring to historical events in Morocco using the Muslim calendar. The flow of time on the timeline will follow the direction of standard Arabic writing, going from right to left, with events on the right-hand side being farther in the past than events on the left-hand side. Morocco and the other Maghreb countries that were colonized by the French use Arabic numerals write the numbers themselves from left to right as the Europeans do. For this, they are an exception in the Muslim world. Earlier dates will therefore be listed to the right on the interface; date ranges will be written with the earlier date on the right, followed by a dash to the left, followed by the later date on the left.

6.3.7. Audio elements

Spoken words as auditory menus and earcons are the primary auditory elements to be considered for CAMEL.

6.3.7.1. Spoken words

Not all audio files will be understood by every Moroccan user. The interface

design is most concerned with getting all users to the variety of cultural heritage materials

that are contained in the CHDL, and not with trying to create a different auditory

interface experience for speakers of each language group or dialect. Under other

circumstances, using voice in an auditory menu would help alleviate some of the inherent

ambiguity. As other research has pointed out, spoken words are not a panacea when

working with interfaces for illiterates (Medhi, Prasad, & Toyama, 2007).

6.3.7.2. Earcons

Earcons should be used in the interface for non-literate users in Morocco as a way

of complementing the icons. Earcons, like icons, can be representational or abstract,

where representational would attempt to digitize actual sounds from the environment, and

where abstract ones would be sounds created synthetically for the purpose of the interface

(Blattner et al., 1989, pp. 21-22). Semi-abstract earcons might also be said to exist, as a

synthesized noise meant to mimic a real sound in the environment or a stylized version of

another sound. For the Moroccan interface to CAMEL, earcons will be semi-abstract

sounds replicating to a certain extent cell phone noises in Morocco. As suggested in

Chapter 5, users will click buttons to launch their queries. A cell-phone ringing sound

will continue for the duration of the time that the system is bringing up the results. To

complete the cell-phone metaphor, a click similar to the sound a phone makes when

being answered will alert users that the search has stopped and that the results are ready

to be examined.

Earcons will enhance the user experience in CAMEL and will reinforce, through

repeated use, the action being taken in the database. Earcons are inferior to verbal menu

elements since they provide only associative mechanisms for the meaning of the button or the action. However, in a CHDL where many resources over time may be recorded in the different national languages and dialects, it is most straightforward to streamline the interface by using representative sounds rather than words, thereby limiting the across the board usefulness and appeal.

6.3.8. Evaluation

Evaluation criteria for the system will need to be established before its creation, in consultation with stakeholders and Moroccan partners. The system should be built with these needs in mind. Inability to put into practice required elements should be discussed and alternate solutions should be identified.

6.3.8.1 Usability testing

Usability testing of the interface, the retrieval mechanism, and the underlying system should be carried out regularly once the CHDL is in place. These usability studies will permit the refinement of the CHDL in terms of actual use and user satisfaction. In collectivist cultures, it will remain difficult to convince test subjects to disrupt the harmony of their interactions with the researchers by criticizing an interface and thereby causing the researchers to lose face. It may be possible to elicit more honest responses on the part of users by insisting on the fact that usability testers are not designers (Yeo, 2001) or that usability testers will themselves lose face if they are not able to submit suggestions for improvements. The execution of usability testing remains complex and its efficacy questionable, but usability testing remains a pivotal part of the evaluation process and is one that must be navigated.

6.4. Conclusion

Creating underlying organization, retrieval, and system elements that are flexible enough to support two kinds of users is necessary for the success of this project. The basic, operational DL is necessary for the beginning of the project, and that more sophisticated interface that continues to permit appropriate access to materials in spite of potential problems with infrastructure can be used in a later phase. This second phase of providing access should permit user participation in a way that is compatible with the read/write web if possible.

Information needs are not immediately associated with life or death the way that food, medical attention, and other life necessities are. Places of great poverty that need development require life necessities for citizens. Other than immediate necessities, people "need, seek, and thrive on emotional relationships with family, friends, neighbors, and colleagues" (Shneiderman, 2002, p. 76). Shneiderman cites the work of Covey, Merrill, and Merrill who posited a formula for life: "living, loving, learning, leaving a legacy" (1994, qtd. in Shneiderman, 2002, p. 80). Access to a CHDL like CAMEL does not meet physical needs, but can begin to provide a modern mechanism to meet social needs in the context of one's culture.

Chapter 7

Conclusions

7.1. Chapter Overview and Purpose

The purpose of this concluding chapter is to reexamine the research questions posed in Chapter 1, to assess the contributions and limitations of the study, to make recommendations for the possible implementation of the project described in this study, and to suggest future work in this area.

7.2. Lessons Learned

The exploratory study of access to non text-based information for non-literate users in the developing world stemmed from five initial research questions. These questions are reexamined here as lessons learned. Although the lessons are meant to be objective, this concluding section will only attempt to synthesize meaning based on content presented earlier in the course of this study.

7.2.1. Cultural usability lessons learned

Questions of culture and universal usability guided the first two sets of research questions. National culture influences individuals; the society where they live will also shape how individuals access new technologies. Fulbright grantees were identified as creators of electronic A/V files that could potentially form the corpus of an online digital library. Access to that library could incorporate benefits.

RQ1: Should we attempt to provide online access to information for non-literate citizens in the developing world?

- Can members of an oral culture benefit from digital libraries, and if so, how?

Meaningfully bettering the lives of citizens in the developing world can include the goal of providing access to information; though information, citizens can be empowered. In considering RQ1, anticipated pros and cons to adapted online information access can first be identified, and a hypothetical comparison can be made to other interventions. Three perceived benefits from access to information for non-literate citizens in the developing world were identified in Chapter 1: increased task-based, computer, and Internet literacies. Based on the study, perceived drawbacks to online access to information include substantial investment in the creation of a CHDL, including the identification of partners, localization of the interface, and challenges of assessment. For many parts of the developing world, a computer-friendly infrastructure is currently lacking and getting online is difficult. Furthermore, predicting the spread of ICTs is unreliable; at this juncture, it seems likely that citizens around the world will be accessing information through the use of ICTs, although the screen size, memory, or connectivity methods of the devices remains to be seen. As with all projects that are not grass-roots, adoption may be difficult to encourage at first; it will help if the online access is very well aligned with the expectations of the national culture.

Outside groups that assist developing countries have not yet tried to promote online access to adapted content for non-literate citizens as described in this study. UNESCO's Education for All report describes other efforts at assisting citizens. Some programs endorse traditional education for youth. Education programs, however, are not always successfully followed by citizens in developing countries who do not have a tradition of formal schooling; standards are low, and adult education is lacking. Another option that is adapted to meeting needs of non-literate citizens is the provision of food

and health care. These basic necessities of life are unquestionably important for the

survival of non-literate citizens, but do not help them in acquiring the skills and literacies

necessary for future information access that could alleviate future problems of access to

human necessities. For a hypothetical comparison of these three kinds of interventions,

see Table 7-1.

Table 7-1: Perceived values for interventions in the developing world from outside organizations.

INTERVENTION FROM OUTSIDE ORGANIZATION	NO INTERVENTION	INTERVENTION FOCUSING ON PHYSICAL NEEDS	INTERVENTION FOCUSING ON SCHOOLING	INTERVENTION FOCUSING ON DL ACCESS
Provides immediate assistance	0	5	1	2
Cultivates reading literacy	0	0	5	1
Cultivates other literacies	0	0	2	5
National culture compatible	0	0	1	4
Benefits citizens or community broadly	0	3	2	4
Total	0	8	11	16

6-point scale, with 5 as highest, 0 as none.

Based on the preliminary assessment, digital libraries for non-literate citizens can

be as beneficial or more beneficial than other initiatives for providing long-term access to

information. Specific group members will have to learn to use the DL requiring a time

investment and will have to procure a computer with a connection. Children learning to

read will also have to wait before reaping the benefits of their work; children will wait

longer to learn to read than adults will wait to find and learn to use a computer.

In summary, citizens of oral cultures will benefit from DL access if it is created in

a way that conforms to universal usability standards – if the content is adapted and the

interface is usable, the perceived benefits suggested in this section can be considered

applicable. The benefits will center on long-term access to information, skills and

literacies useful in the online environment, incentive to cultivate a basic literacy in order

to participate more actively online. The method described is designed to correspond with

national culture both in the conception, execution, and assessment of the project, and in

the interface itself. Benefits are perceived to extend to a large part of the community, as community members possessing specialized literacies are expected to assist others. Although this is similar to the reading work that schooled and literate children would be expected to do for non-literate members of the community, the multiple literacies acquired in the use of the DL will be more universally used in the community. Unlike food, which may be shared with the immediate family or those less fortunate, literacies are not a commodity that must be judiciously meted out, but are an expertise that can be shared freely and can be increased in time with usage, and given to others in the process.

The second of the cultural usability questions focuses more specifically on HCI, culture, and universal usability for non-literate citizens. As was the case with the exploration of RQ1, the exploration of RQ2 is based on perceptions formulated during the course of the study.

RQ2: Can the study of cultural usability contribute to the body of knowledge in the field of human-computer interactions (HCI)?
- How does culture affect HCI?
- Can an understanding of culture and obstacles to access inform DL design and promote usability?

Studying usability as an element closely related to culture has been part of the usability literature since the 1990s. Localization studies have mainly focused on the developed world and users from Western cultures. Universal usability is not concerned with sales through Web sites, but rather with access for the world's people, including those in countries that do not have developed banking systems or online commerce. By studying localization elements identified as being usable in the West, HCI can begin to distinguish usability elements that truly are universal from ones that are Western-based.

In the course of this study, the role of national culture was explored. Because national culture is the result of very specific "mental programming" for a people, it could be argued that every

Culture is learned behavior consisting of thoughts, feeling, and actions. Wilson's (2000) definition of information behavior is the following:

> **Information Behavior** is the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking, and information use. Thus, it includes face-to-face communication with others, as well as the passive reception of information as in, for example, watching TV advertisements, without any intention to act on the information given (p. 49).

Information behavior is culturally-based, and interactions with an interface while using or accessing information will be colored by culturally-based expectations, assumptions, and preferences. The field of HCI tends to look to the individual for usability work, and it is acknowledged that culture can influence the perceptions of the individual. From the point of view of collectivist cultures, concentrating on an *a priori* study of culture may be more beneficial to the project than an *a posteriori* study of individual users. Usability can conceivably be promoted through the well-designed interface and well-supported project.

7.2.2. Systems aspects lessons learned

By focusing on systems aspects that can promote access for non-literate users, theory and frameworks applied in traditional LIS settings can be equally applied in the context of a CHDL.

> **RQ3:** How can LIS theory inform the creation of a DL system for non-literate users?
> * Which aspects of organization of information theory and information retrieval theory can be applied to the special problem of a CHDL?
> * Can and should systems be adapted to meet non-literate user needs?
> * Do practices evident in the read/write Web enhance CHDL systems?

Traditional LIS theory focuses on providing access to textual information for literate users. Those who are not literate are traditionally encouraged to learn to read; libraries are the product of a Western culture that favors the empowerment of individuals through education. Deo et al. (2004) describe the disenfranchised digital library users who are unable to read and who cannot benefit from the A/V materials that are accessible. By focusing on theories and frameworks that permit access to the gamut of A/V materials that can be collected, stored, and made available in the context of a CHDL, it is possible to inform the creation of and the access to A/V documents for non-literate users. Care must be taken to focus on the provision of access instead of empowerment through education. Acquired skills or literacies are byproducts of CHDL use, not a requirement for use.

Requirements of non-literate users will force organization of information and retrieval aspects of the system to focus away from Western traditions to consider other traditions. Documents still need to be analyzed and entered into the system, and access needs to reflect the care taken in choosing adapted access, including meaningful access points. Browsing permits the exploration of collections through access points, and should be considered an integral part of the system. This non-literate interface will not meet the needs of Western researchers used to searching in databases and who are concerned with precision and recall. Based on the study presented here, it is possible to create adapted access for non-literate users; testing concepts through the creation of a project is the next logical step. The extent to which practices drawn from the read/write Web can be integrated remains unclear, but promising. In the section on future work that follows, possible implementations of read/write Web functionalities are discussed.

Citizens of all countries have a right to access information online; when citizens have disabilities, their capacity to access information may be restricted. UNESCO's Education for All team released a report in 2008 citing the poor progress in developing countries of the complementary goals of lifelong learning and adult literacy. Based on current trends, 706 million adults will still lack basic literacy skills in 2015 (Global Monitoring, 2008, p. 94). Not being able to read restricts access to computers and computer technologies for citizens in the Maghreb (Danowitz, Nassef, & Goodman, 1995). Design considerations for DLs need to be rethought when providing access to information in this context. By adapting interface design to accommodate novice users, an introduction to new literacies can take place; by adapting the content that is offered, needs are met on that level as well (Shneiderman, 2002, p. 70).

Interface elements of DLs must provide a way for users to manipulate the underlying system in order to retrieve documents. Usability study developed in the West has contributed to the successful creation of DL interfaces for literate users. Non-literate users cannot rely on the same interface and navigational elements in accessing documents. The fourth RQ investigates the specific elements of the interface that must be localized and wholly reconsidered for use by citizens from oral cultures.

RQ4: What are the elements of DL interfaces that must be adapted for non-literate users and how should these elements be implemented?
- How should CHDL interfaces adapt to culture?
- How should CHDL interfaces adapt to level of literacy?
- How should CHDL interfaces adapt to level of development?
- How can DL systems be enhanced to facilitate current and future usability?
- How does LIS theory assist in these design questions?

Lessons learned in Chapter 5 permit the reexamination of this question as part of this conclusion. Principles of cultural usability based on Hofstede's cultural dimensions

reveal that not all developing countries will have identical values. For this reason, the interface must be localized to non-literate people through the extraction of all text-based elements. After the goals, partners, and content of the project are identified in the first phase of creation, work can begin on the deep localization of the specific interface.

The application of deep localization practices is important in creating CHDL interfaces for users who are unfamiliar with the computer metaphor and who lack basic computer literacies. National culture-inferred preferences should be considered first in the creation of the interface. Universal usability may suggest multi-layer design (Shneiderman, 2003) as a way of promoting literacy, including reading literacies, in the use of the CHDL interface. By working with users, it is possible to create the best design, thereby encouraging usability. Theory and frameworks from LIS for the organization of information and information retrieval assisted with the exploration of the problem of design.

7.2.3. Case study lessons learned

The case of Morocco yields additional points to consider in the examination of elements of interest for the creation of a CHDL for non-literate people in the developing world. It is a representative country in terms of differences with the West but a unique nation among developing countries, having served as a crossroads to many parts of the world throughout much of human history.

> **RQ5:** How does Morocco exemplify the problems of culture, literacy, and development?
> - Can a case study of Morocco inform the study of access in the developing world?

Morocco is like other non-Western countries in terms of having a "mental programming" for its people that potentially places them at a disadvantage when dealing

with the developed world. Based on Hofstede's cultural dimensions and the indexes for

Morocco and other developing countries, basic values are different in these areas and in

the English-speaking West where many software programs are created. Morocco remains

cut off linguistically from English-speaking countries; only the most highly educated

Moroccans will speak English, and only they will be able to take advantage of the

English-language content and community on the Web. Morocco is home to people who

live in extreme poverty at present and who at one time were colonized by a European

power.

Morocco is unlike other developing countries in its composition of complex

cultural elements like language and tolerance. It is widely known that King Mohammed

V protected Jewish Moroccans from France's Vichy regime during World War II

(Cowell, 1989). Morocco's complex relationship with France, and multi-lingual and

multi-racial people, including Spanish influences from the north and three dialects of

Berber throughout the country, creates an extremely intricate linguistic situation.

7.3. Contributions and Limitations

A positive contribution to the quality of life of non-literate citizens in the

developing world is a goal of this study. A related goal is the creation of a database that

can be exploited by non-literate peoples and the researchers who helped create the

primary content. This study's contributions to the fields of LIS and HCI can be identified

primarily in the identification of a new field of study and research. To this point, this

study has considered the benefits to non-literate users. In this section, the contributions to

scholarship and research in the developing world will be taken into consideration.

Limitations to the present study are presented.

7.3.1. Contributions to the field of LIS

This study seeks to enlarge the concept of user group to include non-literate citizens in the developing world. Traditionally, Western librarianship has been interested in serving the needs of literate members of a democracy. In expanding the role of libraries and DL to begin addressing needs of users who are not traditionally served, library services may be meaningfully integrated into the culture of some developing countries. By moving away from the provision of textual information to address information needs, libraries can move to endorse the acquisition of related literacies that respond to social needs, thereby enlarging their role in a way that is responsive to the user community. This proposed paradigm shift in the provision of information in the developing world is compatible with work being done in information science to provide access to diverse materials though adapted systems and interfaces. Cultures that are not historically compatible with the Western culture of solitary reading, research, or study should be accepted and appreciated for what they are, and services should be created that adapt to their needs as they can.

This study also proposes a new method for collecting, organizing, and providing access to documents that could be a source of national pride for non-literate people. The cycle of publishing encourages those who are educated to record history. Creation of cultural heritage documents by an underrepresented group of non-educated citizens democratizes the process of recording and providing access to alternate version of history both for the non-literate people themselves and for researchers abroad. Already villagers who may have never seen a computer have been recorded by Western researchers during fieldwork. By putting that citizen's story into a repository of electronic documents, access can be provided to national history and cultural heritage documents that would never be

known otherwise, inspiring national pride and solidifying equality of access. If read/write

abilities are added to the CHDL interface, the process of democratizing history will be

further enhanced and extended to all users of the system. Giving a voice to those who

have been silent until now may be threatening at present for some governments in the

developing world, but the Web and its ideals of democracy are destined to change the

information policy of these governments sooner or later. This research proposes capturing

that information and making it available now as a source of pride and as an alternate

point of view.

7.3.2. Contributions to the field of HCI

In examining the concept of national culture and the role of deep localization of

Web interfaces, this study suggests that the smallest unit in collectivist cultures will not

be the individual. Therefore, usability testing with individuals will not produce the

desired results. Instead, this study proposes that HCI consider a new approach to usability

testing in the developing world that focuses on the group as the smallest unit to be tested.

By conceding that usability testing may not work in the same way across cultures,

researchers can develop new strategies for testing non-literate users in the developing

world.
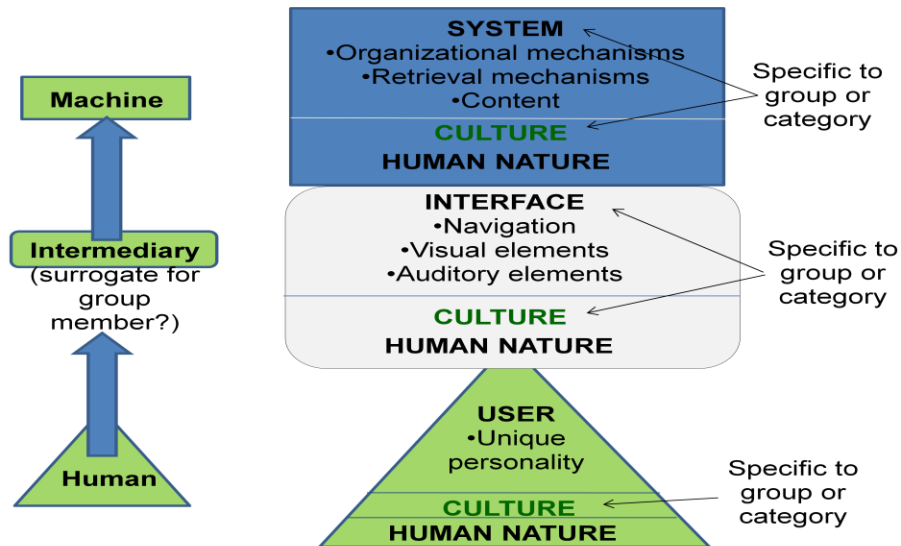
Figure 7-1: Culture as Foundation to Interface and System

Through Hofstede and Hofstede's (2005) model of culture, the theory is advanced

that human nature and culture underlie the mental programming of the individual (see

Figure 2-1). Mental programming or culture will influence usability study as much as

human nature (Figure 3-2), and in the developing world, the importance of culture may

be overlooked. This research concludes that culture is a unique and foundational aspect of

the user's personality, and must be in line with the foundational aspects of the interface

and the system. Both the interface, which is the intermediary between the human and the

machine, and the system itself, including its contents and the access provided to them,

should be compatible with the culture of the user for the experience to be successful.

Localization of any kind will potentially present conflicts in mental programming for the

users.

7.3.4.1 Reinventing the Wheel

Since culture is taken to be the basis of the user's mental programming, and since

culture is unique to a group, each CHDL will need to be created with the unique culture

of the users in mind (see Figure 7-1 for the rationale). While localization has been used as

a way of repurposing content for a varied group of users, the model presented in Figure 7-1 suggests that even the content of a CHDL must be adapted for the culture of the user group. Instead, it is suggested that for non-literate cultures, the notion of national culture be used as a basis for the collection, the organization of the collections, the access and the interface.

7.3.3. Potential contributions to research in developing countries

This study describes the creation of a DL of cultural heritage documents and suggests that if the system and the interface are adapted, non-literate users will want to contribute content when they interact with the CHDL. A DL of culturally focused primary source electronic files will also serve scholarly interests of researchers in the social sciences. Researchers in the humanities or in the sciences may also be interested in recorded information about folk wisdom pertaining to science or customs, practices, and traditions pertaining to the arts. The Western researcher user group closely matches the user group envisioned in the definition of DL given in Chapter 2 this study. The focus of this study has been the creation of an interface for non-literate citizens, but scholars will certainly be interested in such a project as well. Creating a user-friendly interface for literate Western users is now straightforward for experts in usability who operate in the developed world. Digital libraries of materials about developing countries are already in existence and freely available on the Web; in accordance with the meaning of DL employed in the library community, these collections could be supplemented by work being done in the field that is marked-up and ready to exchange in federated systems. The use of standard systems, interoperable metadata schema, and published thesauri facilitate exchange with other systems.

In a project designed as suggested, Western researchers would be the creators of the corpus of electronic documents housed in a CHDL at the beginning of such a project. On-site researchers working in the developing world may be sponsored by an national organization like the Fulbright Program or by an academic institution in a developed country; the researchers will be credentialed and experienced (or in the case of students, mentored and overseen), their research projects will be vetted, and they will have the necessary academic and governmental permissions to carry out their research projects. Researchers, however, may not have a repository to store, organize, access, and archive the electronic documents that they create during fieldwork. For Fulbright grantees, there is no mechanism in place for sharing documents from year to year, as primary documents from fieldwork leave the country with the grantee and are not archived by the United States Fulbright Program or the national commissions. In Morocco, the Moroccan American Commission for Educational and Cultural Exchange (MACECE) does not aid researchers in the management of materials created during field work. Scholar and student grantees may publish work based on these primary documents, but the documents themselves currently remain in the possession of the creators and do not enrich the international scholarly conversation or the local body of knowledge. No current system exists for the systematic treatment of documents created by Western researchers carrying out fieldwork in the developing world.

Researchers may need guidance from information professionals in the organization of and access to electronic documents that they have created. In Morocco, the national library was unable to assist a 2008-2009 Fulbright grantee in archiving oral history interviews done as part of her grant (S. Kramer, personal communication, October

2008). Subsequent researchers have been unable to access these interviews and were unaware of their existence despite topical overlap in projects (K. Norland, personal communication, May 2009).

Citizens of the developing world, both literate and non-literate, have also been excluded from access to electronic documents created by researchers despite the inherent accessibility of audio oral history interviews conducted in the local language. When Fulbright projects were described to educated Moroccan informants, the informants were often surprised. Through work on this study and with CAMEL, I discovered in the oral histories recorded by Kramer that Moroccans had fought with the French in Vietnam during the Indochina Wars. In the interviews, one former soldier describes his time in captivity in a Vietnamese prison and the anti-colonial brainwashing efforts of his captors (see Figure 7-2 below). Another former Moroccan soldier described staying in Vietnam until 1970. He brought his Vietnamese wife and children back to Morocco when he returned, answering the call of the Moroccan king for all Moroccans with children abroad to return to the homeland. An interview with his wife revealed that she had quickly learned Derija and converted to Islam after arriving in Morocco. Such little-known histories are a treasure for researchers, for educated Moroccans, and for uneducated Moroccans alike; these are among the recordings, photos, and transcriptions created by a Fulbright grantee that were not accepted by the BNRM in October 2008. By creating an electronic database for scholars that organizes and provides access to unique content such as this, scholarship can advance in fields where little is known at the present time.

Figure 7-2: Interviewee Bel Bacha A) Moroccan soldier for France, 1951 B) Pro-Morocco Citizen, 2008.[16]

7.3.4. Limitations to this study

This study acknowledges limitations due primarily to the theoretical nature of the methodology chosen for study. The research questions guiding this study focused on design instead of implementation. Because there are no empirical results relating to the research questions, it is impossible to compare the results of this study with the findings reported in other studies. The interdisciplinary nature of the study could also be perceived as a limitation. The methodology primarily consisted of a review of relevant literature and considerations for applications based on a 10-month in-country experience in Morocco. Literature used comes from the fields of anthropology and cultural studies, media and communication studies, HCI and cognitive sciences, computer science, as well as LIS. The methodology employed in this research is valid, but it may not be the

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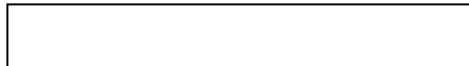
[16] Photos by S. Kramer, Fulbright Grantee in Morocco, 2007-2008, *Stories of Western Presence.*

preferred method in any of the fields mentioned. Comparisons with empirical research

projects are therefore not possible.

7.4. Recommendations

These recommendations listed below go beyond the scope of the detailed

suggestions already given for the system and the design (Chapter 5) and possible

implementation (Chapter 6) to provide recommendations based on the study itself and the

responses to the RQs that were addressed in the first part of this chapter. A revised

understanding of universal usability and a set recommendations relating to CHDL

administration are discussed.

7.4.1. Revised goals for universal usability

Due to poor infrastructure in developing countries, calls to reassess universal

usability goals have been made. Current goals can be considered unreasonable and

impracticable (Klimaszewski & Nyce, 2009). In light of the above discussion of the

evolving role of LIS in the developing world and with the understanding that developing

countries with a low Individualism Index (IDV) on the cultural dimension identified by

Hofstede will not have the same expectation or mental programming regarding universal

access for individuals, a revised set of goals for universal usability should be considered.

Revised goals for universal usability will retain basic and fundamental expectations for

usability of interfaces and accessibility of content, especially in urban areas. The current

reality of limited access in rural areas and the projected limitations of non-literacy require

goals dependent on universal access to be reconsidered. Klimaszewski and Nyce (2009)

suggest the introduction of ICTs in underprivileged areas in Europe through the primary

and secondary school systems. In rural areas of poor countries in the developing world,

the culture of education is not favorable to this suggestion. Instead, cultures in the

developing world tend to rely strongly on the group, on the role of the individual as a

member of the group, and on orality as a method of information transfer within and

between groups. Instead of looking at households as the smallest unit that must have

access to the Internet in rural areas, this research continues to express the notion that the

group may be the smallest unit in developing countries. A revised but not less ambitious

goal for universal usability could be to promote computer literacy among one or two

members of an entire rural community, who would then be expected to serve as the

"literate" members when other group members go to use the computer. The goal of

universal usability would shift in rural settings; instead of meeting limited information

needs of individuals as part of households, it would meet social needs of groups. Each

group would have a go-to person that would be in line with pre-established cultural

expectations. That person or those people could be designated as *passkeys*.

From this study, the recommendation can be made to restate the goals of universal

usability to providing access to 90 percent of groups, through one or more passkey

community members able to access adapted content on the Internet on behalf of all

members. These passkeys will able to develop necessary computer literacies or ICT

literacies in the process, making them resources in the community. While the limiting of

information flow to a select group of gatekeepers can be considered undesirable in

Western models of information access, this study takes the opposite viewpoint in this

context, welcoming a select few as the social passkey permitting computer access. In

urban areas of Morocco such as Rabat (A. Alamidrideb, personal communication,

September 2008) and Tangiers (F. Ihrai, personal communication, October 22, 2009), it is

common to have one member of the household, often a son, the person who sets up and

orchestrates online access. In urban areas this is reasonable, but in rural areas, one

passkey per village may be a more reasonable goal, carrying with it a similar impact.

7.4.2. Relevant models

One way to appeal to users' mental programming or learned behaviour is through

the provision of access using models that correspond with existing mental models.

Metaphors based on models that are relevant to oral cultures may be more immediately

meaningful, thereby providing more seamless access to CHDL content. Models that can

be adapted to use in the DL environment may contribute to the user experience. The

souk, or market, as metaphor of organization of content may contribute to a souk model

for DL construction and access. Requiring interactive bargaining or bartering for

comments (i.e. content may be retrieved if the user will make an audio social tag in

response) as a way of retrieving content may increase user satisfaction with the user

experience and demonstrate value of both the content accessed and user contributed

content made in return. By refining relevant models and applying them in the CHDL, it is

possible to move away from the Western approach to systems and build upon the culture

of citizens in the developing world.

7.4.3. Strategic partnering

A more successful CHDL experience for actual non-literate users can also be

encouraged through revised goals of universal usability. In the flow chart of a CHDL

localization project (Figure 3-4: CHDL Design Flow Chart), Phase 1 was the

identification of project goals, stakeholders and partners, and parameters for evaluation.

This administrative work should be followed up with additional support that will lend

itself to the success of the overall project. Before collecting content, permissions needed

to post cultural heritage documents to the Web should be investigated. Local legal

council should be secured to insure that the permissions forms are adapted to local people and local practices. Researchers creating documents for inclusion should be trained in the administration of permission forms, especially documents involving protected groups such as children, prisoners, or illiterate peoples.

A reduction in costs through innovation, automation, and planned sharing is desirable. Selection and acquisition of quality content should be streamlined by partnering with organizations that produce good work. This study has suggested using electronic versions of documents created by researches and student grantees of the United States Fulbright Program. Formally, as one of the recommendations of this study, the suggestion of approaching the Fulbright Program with an official proposal should be considered. With the Obama Administration's stated interest in expanding the program (McMurtrie, 2009), such a project could be immediately beneficial to the sponsoring institution as well.

7.5. Future Work

Recommendations for future study seek to identify elements that will enhance the user experience (UX) with the CHDL. Although this section will continue to consider both cultural usability elements and systems elements, many of the suggestions for future work focus on systems elements. Because organization of information, IR, and the read/write Web converge and overlap as systems elements, subcategories of the section of systems will be considered in a somewhat fluid order in which they may usefully be implemented rather than in an order that places them in certain domains within the study of LIS.

7.5.1. Cultural usability studies in the developing world

This study brings into question the LIS assumption that DLs and libraries are only for literate individuals and the HCI assumption that individuals are needed for usability testing. Future work should test these assumptions as a way of further contributing to the literature in these fields. This could best be done through the creation and testing of a CHDL. Comparative studies of users in the developing world would be permitted if the CHDL were implemented in a series of countries and in turn made available on the Web. The CHDL would permit the formal study of non-literate users in different developing countries and their approach access to electronic formats and online information. If partnering with an international organization and implementing CHDLs in a series of developing countries, cultural usability markers, cultural markers that enhance usability, should be measured and mapped to cultural dimensions and values of the countries. Longitudinal studies for a given country should attempt to assess the degree of change that can be brought about in an in-group though the increased computer literacy of a given member or passkey. Once identified, these users could be studied in different technology-rich environments to ascertain the extent to which their use of the CHDL prepared them for using other systems on the Web at large. Without having set up and carried out a CHDL implementation, it is not possible to know all options for identifying and implementing cultural markers. However, based on systems work that has been done in the developed world, it is possible to suggest future work that could potentially improve cultural usability.

7.5.2. Systems work

Initial work with systems should strive to alleviate the need for human intervention in the acquisition of documents allowing for autonomous uploading by

authorized researchers or individuals. An automatic system to create document metadata should be created; this system could have some or minimal human input. In an option permitting human input, researchers could upload their own documents and provide metadata for them in the same way that Web users provide metadata for YouTube videos or Flickr photos. The CHDL would serve as a repository for these documents, permitting researchers to rediscover documents created as fieldwork. Researchers who are contributors could be instructed to enter metadata including author name, subject name, location, keywords, and information about funding agencies, date of creation, and associated organizations. For any audio or video files with recorded conversations, a transcript should be furnished if available, as well as any translations. Documentation to guide the creation of metadata and the addition of supplementary resources should be easily available.

Automating from the systems side can enhance accuracy of metadata and speed of acquisition. In the absence of author-generated metadata, or as a means of checking and confirming the data entered by researchers, the system should be able to create metadata based on the document itself. Format data is trivial to generate; aboutness data, including topic, location, and time period, will be more difficult. For audio files, speech recognition should be used to ascertain the topics of the document from utterances in the body of the document itself. Topics should be mapped to descriptors used as access points, and administrators should periodically confirm that the descriptors in use as access points are sufficient. Further discussion of automated treatment of documents will follow in the sections below.

7.5.2.1. Speech recognition work

Advancements in speech recognition can help provide a more robust experience for non-literate citizens and non-computer literate citizens. Speech recognition software may not be immediately useful for languages spoken in the developing world or for dialects and regional variations of languages that emerge. Speech recognition software can be trained based on the speaker's pronunciation, and the development of software for less common languages is possible if financial resources to fund the work are made available. Speech recognition software for native speakers of English is currently inexpensive yet powerful.

Figure 7-3: Sony Vaio Laptop with Speech Recognition Software Active; Bluetooth Headset.

Portions of this dissertation, including this paragraph, were initially dictated using a Bluetooth headset and the free Microsoft speech recognition software included with the Windows version of the Sony Vaio software suite (see Figure 7-3). Interactions with the system are not flawless, and numerous typographical errors were introduced into this dissertation as a result, but the software has proven to be trainable and intuitive to use for this writing project and has provided a good experience overall.

Querying the system using speech recognition

Instead of offering a limited interaction with the system based solely on visual and auditory mechanisms, a CHDL using adapted speech recognition could allow users to query the DL using the spoken word. If the system could recognize the content of the audio documents and video documents containing speech, a reasonable next step would

be to teach the system to recognize topical requests from users. Words spoken by the user could be matched against words in the documents, or segments of the documents, and ranked results could be given based on the content of the documents in the CHDL.

Navigation through spoken word sound bytes

It is possible to envision a third interface for the database, one for semi-literate or non-computer literate users that also makes use of speech recognition capabilities described in this section. Instead of being offered icons, users of the intermediate interface would be offered buttons composed of text instead of buttons composed of icons for the topical elements in the database. A combination of text and icons is considered less effective than either text or icons alone, and studies of users in developing countries could add to the current body of knowledge on the topic. By situating the mouse over the text, users should be able to hear the pronunciation of the text based on the way it is spoken in one of the document. This interface for semi-literates could be seen as an extension of the interface for non-literates and could be included as a level that could be attained or unlocked if so desired, as described as part of a multi-layer design interface (Shneiderman, 2003).

Commenting documents

Listening to recorded speech is considered to be difficult, but recording one's own speech is not (Arons, 1997). If approached as part of the process of human activity, the third of the Four Factors, *create* can be accomplished through the addition of content by users. Participatory elements associated with the read/write Web permit the democratization of content creation to reach members of primarily oral cultures, allowing

them to share their perspectives on topics pertaining to their cultural heritage (see Figure 7-4).
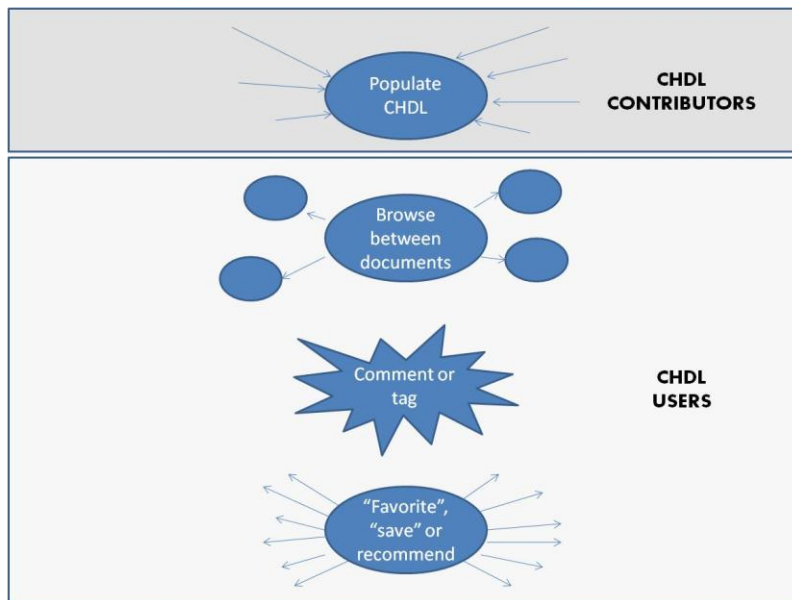
Figure 7-4: Four Factors of Human Creativity and the CHDL.

Categorizing documents using auditory social tags

Linguist Crystal advocates a "parallel track" for taxonomies that draws from both established systems and "real languages" (2007, p. 221). Also through the use of speech recognition, users should be allowed to leave audio social tags on documents after listening to them. Audio tags associated with certain documents could then be made searchable. Much as the "shuffle" setting for music software allows for the arbitrary playing of tracks, each audio tag could be considered a track. Users would also be able to participate in the organization of information and even the provision of supplemental information.

Users could access the social tags for a document by mousing-over the document's thumbnail. After arriving at a chosen document, a sort of verbal tag cloud would be generated by calculating the number of times the most popular text had been spoken and by playing in unison the voices of the users speaking that term. Audio

comments by users longer than single-word tags could be run through speech recognition software and included in the list of tags based on frequency in the comment. For a fuller discussion of audio comments, see the section below.

Seeding the participatory element

It is often considered that on a Web scale product, there must be a critical mass of users who participate. In order to set an example for the types of comments that would be made, the database could automatically draw in speech from the body of the document and use that as seed for the creations of social tags and comments. Users involved in testing the system could also be requested to make comments on documents as they listen to them through the use of vocal prompts.

7.5.2.2. Geolocalization work

Geo-tagging is the application of tags to designate physical locations (Kennedy et al. 2007, etc.) in online social networking environments like Flickr. When geo-tags are automatically generated, it is through the use of location-aware photo devices equipped with special software. Manually, it is possible to add information about latitude and longitude as textual tags (Torniai, Battle, & Cayzer 2007), if that information is known.

Tags and geo-tags can be seen as a sort of online labeling system akin to standard indexing in function and similar in mechanics to author-supplied keywords. The use of the map for retrieval and display adds an additional support to the retrieval task. In online image repositories like Flickr, this additional metadata serves as a platform for result set visualization that can meet the information needs of novice users as well. Documents relating to a geographic location in the developing world should contain coordinates to permit the geolocalization and subsequent visualization. Metadata enabling

geolocalization should be input as linked data structures, referring to locations in established thesauri like the *Getty thesaurus of geographic names online*. The use of linked data will permit interoperability with other systems, independent of the name used for the location in question. Crystal (2006) uses the example of geographical locations and taxonomy as the quintessential example of the efficacy of the semantic Web. Researchers would be asked to provide location information about the documents they input either by situating it on a map or selecting a precise location name so that coordinates could be assigned automatically.

7.4.2.3. Interface personalization by users work

A personalized interface for users based on individual characteristics would provide a more conducive environment for information access. Personalization could take three forms: a set of design or color preferences to make the use of the CHDL more appealing, a linguistically-adapted audio section to facilitate comprehension, or an increasingly more complex multi-level interface as described by Shneiderman (2003). Users in developing countries are not expected to become textually literate from using a CHDL, but may advance in their use of computers. Users familiar with ICTs and new technologies have potential to advance very quickly in their understanding of the CHDL system, and will want to be able to personalize as they go.

The benefits of an increasingly complex interface based on personalization are twofold. First, users in developing countries may be more motivated to persist in their use of the CHDL if they can "unlock" more features through use and mastery of the basic interface commands. This supposition is based on Western studies of users and may not apply to users in the developing world; an experiment testing motivation on the parts of users could provide further insight. As users began to use increasingly more complex

interfaces, they would be drawing closer to a standard Web experience of literate users. Through the mastery of a few combinations of keystrokes, a URL that semi-literate users or very ambitious non-literate users learn could permit them to make the transition to using the Web at large, thus fulfilling the initial goal of universal usability. The more they use the Internet, the more familiar they will be with certain foreign conventions such as icons (Knight et al., 2006) and the closer they can move to being computer literate. Depending on the design, it may be possible to expose users to content on the Web from within the CHDL.

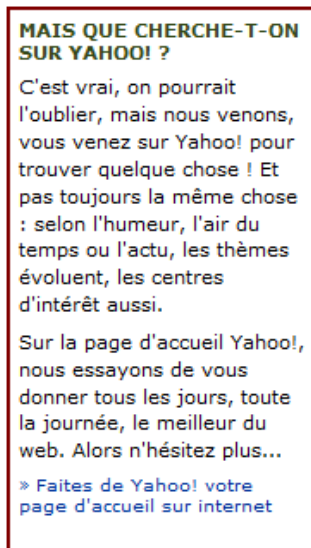### 7.4.2.4. The best of the CHDL work

By suggesting highly rated content to users of CHDL, satisfaction can be improved. Websites such as the Yahoo! homepages actively display "best of" content dynamically, showing the results of popular searches or click-throughs. Displays of best content can be accomplished with the use of images. This box in Figure 7-5 was taken from the directory of Yahoo! France, reminding users of the variable and changing nature of their own search patterns (see Figure 7-5[17]). In Chapter 5, it was suggested that the CHDL interface display a ribbon of popular or suggested thumbnails for images, videos, and audio documents on the interface. These thumbnails should be clickable, immediately opening the selected document. This "best of" content could serve as a point of departure in lieu of browsing for the CHDL.

MAIS QUE CHERCHE-T-ON SUR YAHOO! ?

C'est vrai, on pourrait l'oublier, mais nous venons, vous venez sur Yahoo! pour trouver quelque chose ! Et pas toujours la même chose : selon l'humeur, l'air du temps ou l'actu, les thèmes évoluent, les centres d'intérêt aussi.

Sur la page d'accueil Yahoo!, nous essayons de vous donner tous les jours, toute la journée, le meilleur du web. Alors n'hésitez plus...

» Faites de Yahoo! votre page d'accueil sur internet

Figure 7-5: From the Yahoo! France directory.

A/V Portal

If it is possible to make additions to the interface that do not take away from the clean look and feel, it would be possible to pull in A/V Web resources that relate to the browse users have launched. Ideally, these resources will be embedded in the interface and will be the result of a federated search not only of the contents of the CHDL, but also of A/V Web resources freely available on the Web, but that usually require text-based

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[17] WHAT ARE WE LOOKING FOR ON YAHOO!? It's true, it's possible to forget, but we all come to Yahoo! in search of something! And it's not always the same thing: according to our moods, what people are talking about, or the news, topics change and the things that matter to us do, too. On the Yahoo! homepage we try to give you the best of the Web all day, every day. So, don't hesitate any longer… >> Make Yahoo! your Internet homepage. (retrieved October 9, 2009 from http://fr.yahoo.com/more.html)

searching to retrieve. By taking the controlled vocabulary keywords for the terms associated with the index(es) being browsed and automatically entering them in video search engines like Blinx or photo sharing web sites like Flickr, web content could be displayed concurrently as results. Displaying web content originally posted elsewhere in the CHDL interface is a mashup of the content. Yahoo! Pipes is a free resource permitting the creation of such mashups.

Users should be able to interact with external content viewed through the CHDL interface the same way that they interact with documents housed in the database. If the users choose to comment a mashed-up resource, the system should automatically create a permanent URL for the document and associate the comment with that link. From that point forward, the document could be considered an extended part of the CHDL.

Favoriting

As a means of participating in the conversation surrounding the documents that are part of the CHDL, users may want to rediscover documents. It is possible to imagine that users would want to share a document with others or re-experience the document again on their own. By favoriting a document, either in the CHDL or one found via the CHDL, users can enjoy some of the feelings of ownership that the read/write Web permits and have a sense of participation in a larger community.

Creating User Logins

Users could create verbal user names and passwords, allowing them to modify their interface, save preferred documents, and group all resources they have seen, documented, or liked. Layers that Shneiderman (2003) described could be created and saved based on these profiles, and information gleaned from any profile-related

information could be included in the algorithms powering the recommender features. Systems elements could be enhanced through the creation and use of user logins.

7.5.3. Mobile phones and other devices

While this study focused on the creation of a CHDL that was accessible via the Internet through any number of Web-enabled devices (desktop computer, laptop, netbook, or even smart phone), it could have focused on the use of any number of ICT devices as a means of providing access to cultural heritage materials. Mobile telephones are the most obvious devices to investigate given the context of the study. Users in the developing world are acquiring and using mobile phones, but these phones may be very old, with poor resolution screens or worn keypads (Chipchase, 2008). Phones that look new and expensive may be missing important internal components (Heeks, 2008). Mobile phones in developing countries may be limited, but "current growth rates will likely carry usage to more than 90 percent of the world's population" (Heeks, 2008, p. 28). Universal usability of mobile phones, therefore, is a goal that can expect to be met for the entirety of the world's population, but the quality, the penetration, and the cost of such devices remain unknown. Projects such as *Storybank* in India have already taken advantage of mobile phones for interactive applications for non-literates, inviting villagers to record their own content with a cell phone and tag it, then display it to others in the community (Jones, Harwood, Buchanan, & Lalmas, 2007; Jones, Thom, Bainbridge, & Frohlich, 2009). *Storybank* is also incorporating images and stories access through iPods. Access to content through new media is difficult to predict, and Jones, Thom, Bainbridge, & Frohlich (2009) acknowledge that they cannot be sure that citizens in the rural Indian village where they work will gain access in the medium term, but they have chosen to anticipate that they will.

7.5.4. Consideration of other theories and frameworks

Other theories and frameworks besides the ones mentioned could serve to help understand the best way to make available cultural heritage information to non-literate users in the developing world. Two such approaches are gaming studies and ICT for Development (ICT4D).

Gaming studies

Gaming studies have not yet been applied to the question of digital library use in the developing world. Theories applied to communities of gamers in the developed world may serve to help understand motivation in the developing world for communities of users. Motivation, communication within the community, and preferences might all assist in the exploration of the problem of non-literate user access.

ICT4D

This research has attempted to understand how structures could be put into place as a way of supporting access. Eventually, the promotion of access through participatory features offered by the read/write Web would allow non-literate users to become increasingly invested. Heeks (2008) speaks disparagingly of pro-poor innovation emanating from outside of poor communities that does not conform to their needs. The *Storybank* project in India is an example of innovation from the developed world to benefit users in the developing world. Brady, Dyson, and Asela (2008) also study mobile phones among rural poor; they find that technology must play to the strengths of a culture while creating incentive for use. Grass roots IT networks have appeared in developing countries since the 1980s when IT was able to provide a better solution for communication than traditional means could permit (Goodman, Press, Ruth, &

Rutkowski, 1994). ICT4D demonstrates that development will not follow a path that has been laid out, but will take the path that is the easiest and that makes the most sense in context.

7.5.5. Making sense in context

This theoretical study of the possible implementation of a CHDL in the developing world has focused on Morocco, but could potentially be applied in other contexts that are outside of the traditional library service paradigm. If the framework for the creation of a CHDL is applied in a way that is sensitive to non-Western cultures, it could potentially be employed to create access for communities such as Native Americans, First Nations peoples, new immigrants to Western societies who lack linguistic skills in the new target language, and others.

Throughout this study, the importance of respecting cultures that are different has been repeated. By working in the context of the recipient culture rather than through Western ones, CHDLs can attempt to provide new and innovative services to user groups that historically have been difficult to serve in traditional libraries.

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Appendix A

Countries of francophonie Africa and Internet penetration

COUNTRY[1]	INTERNET USERS	% OF USERS IN AFRICA	POPULATION (2008 EST.)	PENETRATION (% POP.)
Benin	150000	0.3%	8294941	1.8%
Burkina Faso	80000	0.2%	15264735	0.5%
Burundi	60000	0.1%	8691005	0.7%
Cameroon	370000	0.7%	18467692	2.0%
Cape Verde	37000	0.1%	426998	8.7%
Central African Rep.	13000	0.0%	4434873	0.3%
Comoros	21000	0.0%	731775	2.9%
Congo	70000	0.1%	3903318	1.8%
Congo, Dem. Rep.	230400	0.5%	66514506	0.3%
Cote d'Ivoire	300000	0.6%	18373060	1.6%
Djibouti	11000	0.0%	506221	2.2%
Egypt	8620000	16.9%	81713517	10.5%
Gabon	81000	0.2%	1485832	5.5%
Ghana	650000	1.3%	23382848	2.8%
Guinea	50000	0.1%	10211437	0.5%
Guinea-Bissau	37000	0.1%	1503182	2.5%
Equatorial Guinea	8000	0.0%	616459	1.3%
Mali	100000	0.2%	12324029	0.8%
Morocco	7300000	14.3%	34343219	21.3%
Mauritius	340000	0.7%	1274189	26.7%
Mauritania	30000	0.1%	3364940	0.9%
Mozambique	200000	0.4%	21284701	0.9%
Niger	40000	0.1%	13272679	0.3%
Rwanda	150000	0.3%	10186063	1.5%
Sao Tome & Principe	23000	0.0%	206178	11.2%
Senegal	820000	1.6%	12853259	6.4%
Chad	60000	0.1%	10111337	0.6%
Tunisia	1765430	3.5%	10383577	17.0%
Totals and average	**21616830**	**42.5%**	**394126570**	**5.48%**

[1] Francophone or *francophonie* countries in Africa identified at OIF Member State page: http://www.francophonie.org/oif/membres.cfm (2009).
[2] Chart compiled from statistics at Internetworldstats.com (2008).

Appendix B

Top Moroccan Government Web Sites per Google

	Title of Site (search site:.gov.ma)	URL
1	Site Officiel du Département des Télécommunications	www.septi.gov.ma/
2	:Direction des investissements:. Investir au Maroc	www.invest.gov.ma/
3	Portail Internet du Ministere de l'Economie et des Finances du Royaume du Maroc	www.finances.gov.ma/
4	Ministère de la Modernisation des Secteurs Publics	www.mmsp.gov.ma
5	Site Web du Ministère de la Santé	www.sante.gov.ma/
6	:: Royaume du Maroc : Administration du Tourisme	www.tourisme.gov.ma/
7	::: MHU : Programme villes sans bidonville	www.vsb.gov.ma/
8	RENCONTRES DES COLLECTIVITES LOCALES - 2006	www.collectiviteslocales.gov.ma
9	Centre Royal de Télédétection Spatiale	www.crts.gov.ma
10	*site de l'académie régionale de l'éducation et de la formation-région orientale marocaine.*	*MALWARE warning from Google*
11	Caisse Marocaine des Retraites - CMR :. ------------------------	www.cmr.gov.ma/
12	bienvenue sur le site officile de la chambre de commerce	www.ccisc.gov.ma/
13	لجريدة الرسمية للجماعات المحلية	www.bocl.gov.ma
14	Douanes Marocaines : Administration des Douanes et Impôts Indirects	www.douane.gov.ma
15	قطاع محاربة الأمية والتربية غير النظامية :::	www.alpha.gov.ma
16	agadir-indh - Accueil	agadir-indh.gov.ma
17	joscraste - Accuei	www.enssup.gov.ma/craste
18	essaouira-indh.gov.ma - Accueil	www.essaouira-indh.gov.ma
19	Agence Urbaine d'Errachidia - Accueil	www.auer.gov.ma/aue
20	DEPARTEMENT DE L'ENSEIGNEMENT SUPERIEUR, DE LA FORMATION DES …	www.enssup.gov.ma/INTERFACES/
21	Convergence Urbanisme - Habitat 2006	www.mhuae.gov.ma/convergence2006
22	Convergence 2008	www.mhuae.gov.ma/convergence2008/
23	وزارة الاقتصاد و المالية -المملكة المغربية	www.finances.gov.ma/arabe
24	Réseau marocain des interfaces - Accuei	www.enssup.gov.ma/interface/
25	Manifestation Scientifique	www.men.gov.ma/jscience
26	Renforcement des capacités institutionnelles du système éducatif ..	procadem.men.gov.ma/
27	Opération un Million de Cartable || MEN||	www.men.gov.ma/cartable2008
28	[Initiative Nationale pour le Développement Humain]	www.indh.gov.ma/
29	Ministère de l'Equipement et du Transport	www.mtpnet.gov.ma/
30	المندوبية العامة لإدارة السجون و إعادة الإدماج	www.dapr.gov.ma/
31	Code de l'Urbanisme	www.codeurbanisme.gov.ma/
32	زارة الثقافة المملكة المغربية	www.minculture.gov.ma/
33	Portail de la Trésorerie Générale du Royaume	www.tgr.gov.ma/
34	Conseil déontologique des valeurs mobilières	www.cdvm.gov.ma/
35	Bienvenue au Site web de l'Energie et des Mines	www.mem.gov.ma/
36	لوزارة المكلفة بالعلاقات مع البرلمان	www.mcrp.gov.ma/
37	Ministère du Commerce Extérieur	www.mce.gov.ma
38	ADS - Portail national de l'Agence de Développement Social - Maroc ...	www.ads.gov.ma
39	الأمانة العامة للحكومة	www.sgg.gov.ma/
40	Ministère de l'Education Nationale..	www.men.gov.ma/
41	Enseignement Supérieur au Maroc	www.enssup.gov.ma
42	Ministère de l'Habitat, de l'Urbanisme et de l'Aménagement de l'Espace	www.mhu.gov.ma
43	Administration des Fonds de Travail	www.aft.gov.ma/
44	Programme d'urgence || MEN||	www.men.gov.ma/purgence

45	MINISTERE DU DEVELOPPEMENT SOCIAL		www.social.gov.ma/
46	Ministere de la Jeunesse et des Sports		www.secj.gov.ma
47		وزارة العدل	www.justice.gov.ma/
48	Gestion des Etablissement Scolaires		forum.men.gov.ma
49	Département de l'Education Nationale		www.men.gov.ma/grh
50	Direction Générale des Impôts		www.tax.gov.ma/
51	Portail national du Maroc		www.maroc.ma/

Curriculum Vita

Heather Lea Moulaison

Education

2010   PhD, Library and Information Science. Rutgers, The State University of New Jersey.

2002   MS, Library and Information Science. University of Illinois at Urbana-Champaign.

2001   MA, Interdisciplinary French Studies. University of Illinois at Urbana-Champaign.

1996   BA, English. University of Missouri-Columbia, Magna cum laude, departmental honors.

1996   BA, French. University of Missouri-Columbia, Magna cum laude.

1996   Diplôme d'études universitaires françaises (DEUF) Université Jean Moulin, Lyon III, France.

Experience

2008- 09   Visiting Professor, Fulbright Senior Scholar, École des Sciences de l'Information, Rabat, Morocco,

2008   Research Intern, Team of Dr. Lynn Silipigni Connaway, OCLC Research, Dublin, Ohio.)

2007-08   Instructor (Teaching Assistant), School of Communication, Information and Library Studies, Rutgers, The State University of New Jersey, New Brunswick, New Jersey.

2005-07   Cataloging/Modern Languages Librarian (tenure track faculty, *Librarian II*), TCNJ Library, The College of New Jersey, Ewing, New Jersey.

2005-06   Instructor (Part-Time Lecturer), Department of Library Science, School of Communication, Information and Library Studies, Rutgers University, New Brunswick, New Jersey.

2002-05   Cataloging Librarian and Assistant Professor of Library Science, (tenure track ranked faculty), Duane G. Meyer Library, Catalog Department and Department of Library Science, Missouri State University, Springfield, Missouri.

2001-02   Indexer/Abstractor (Graduate Assistant), Mortenson Center for International Library Programs "Database on Censorship" Project, Rare Books and Special Collections Library, University of Illinois at Urbana-Champaign, Champaign, Illinois .

2000-01   Instructor (Teaching Assistant), Department of French, University of Illinois at Urbana-Champaign, Urbana, Illinois.

1998-00   Instructor (Teaching Assistant), Department of English, Université de Bourgogne à Dijon, Dijon, France

1997-98   Instructor (Teaching Assistant), Department of French, University of Illinois at Urbana-Champaign, Urbana, Illinois.

Scholarly Activity
Refereed Journals
Moulaison, H. L. (in press). Subject access to materials in online library catalogues: Discovery of Moroccan publications. *The Journal of North African Studies.*

Moulaison, H. L. (2008). Exploring access in the developing world: People, libraries, and information technology in Morocco. *Library Hi Tech, 26*(4), 586-597. DOI: 10.1108/07378830810920914

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Moulaison, H. L. (2009). Facebook à la Fulbright. *American Libraries, 40*(9), 60-62.
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Corrado, E. M. & Moulaison, H. L. (2006). Integrating RSS Feeds of New Books into the Campus Course Management System. *Computers in Libraries, 26*(9), 6-9, 61-64.

Conference Proceedings
Murphy, J. & Moulaison, H. (2009). Social Networking Literacy Competencies for Librarians: Exploring Considerations and Engaging Participation. In D. M. Mueller (Ed.). *Pushing the edge: Explore, extend, engage: Proceedings of the Fourteenth National Conference of the Association of College and Research Libraries, March 12-15, 2009, Seattle, Washington.* (pp. 328-330). Chicago: Association of College and Research Libraries.

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Moulaison, H. L. & Corrado, E. M. (2007). Analog v. Google in the CMS: RSS feeds to the rescue. In Hugh A. Thompson (Ed.), *Sailing into the Future - Charting Our Destiny: Proceedings of the ACRL 13th National Conference, March 29 - April 1, 2007* (pp. 158-166). Chicago: Association of College and Research Libraries.

Moulaison, H. L. & Weech, T. L. (2007). Traditional and digital library science education: Skills for a digital environment. In H. K. Achleitner & A. Dimchev (Eds.) *Globalization, digitization, access, and preservation of cultural heritage: Papers from the international conference, Sofia, Bulgaria, 8-10 November 2006* (pp. 167-175). Sofia, Bulgaria: St. Kliment Ohridski, University of Sofia.

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Moulaison, H. L. (2005, October). The French love affair with online information systems: From the 1980s to the present day. Paper presented at the 30th Annual European Studies Conference, Omaha, Nebraska. Retrieved from http://www.unomaha.edu/esc/2005Proceedings/FrenchLove.pdf

Moulaison, H. (2005). Fair's fair: Intellectual property, fair use, and copyright. In C. J. Ury & F. Baudino (Eds.) *Brick and Click Libraries: Proceedings of an academic library* symposium (pp. 83-91). Maryville, MO.: Northwest Missouri State University.

Presentations

Workshop: Moulaison, H. L. (2009, April). Le Format MARC : une introduction (pour débutants). United States Embassy, Rabat, Morocco.

Moulaison, H. L. (2009, March). La BU et les compétences informationnelles en réseautage social (CIRS) pour les professionnels de l'information. ENSSIB, Lyon, France.

Murphy, J. & Moulaison, H. (2009, March). Social Networking Literacy Competencies for Librarians: Exploring Considerations and Engaging Participation. Paper presented at the Association of College and Research Libraries 14th National Conference, Seattle, Washington.

Corrado, E. & Moulaison, H. L. (2008, August). Social tagging and communities of practice: Two case studies. Paper presented at the 10th International Conference of the International Society for Knowledge Organization (ISKO). Montreal, Canada.

Moulaison, H., Tonkin, E., & Corrado, E. (2008, June). Linking communities of practice online. Paper presented at the Cultural Attitudes towards Technology and Communication (CATaC08), Nîmes, France.

Moulaison, H. L. & Corrado, E. (2008, May). *Library subject guides 2.0.* Joint ASTED/CBPQ Conference. Montreal, Canada.

Moulaison, H. L. & Corrado, E. (2008, March). *Libraries as Web 2.0 portals to learning.* EDUCAUSE's NERCOMP (North East Regional Computing Program) 2008 Annual Conference. Providence, Rhode Island.

Table talk: Weech, T. M., chair (2008, February). *The globalization of education for digital librarianship: Implications for iSchools in North America.* Presenters: Heather Moulaison, Tatjana Aparac-Jelusic, Stephen Downie, Michael Lesk and Anna Maria Tammaro. Round

table at iSchools' iConference 2008. UCLA's Graduate School of Education & Information Studies, Los Angeles, California.

Moulaison, H. L. (2007, October) *Social tagging in France: The evolution of a phenomenon. In panel:* Corrado, E. M., Kipp, M., Zhang, Q., Moulaison, H. L., Tonkin, E., and Pfeiffer, H. D. Tagging and social networks: The impact of communities on user centered tagging (SIG TAG, SIG KM and SIG CR). Panel presented at the American Society for Information Science & Technology (ASIS&T 2007) Annual Conference. Milwaukee, Wisconsin.

Moulaison, H. L. (2007, May). *OPAC search queries: An analysis of academic library search logs.* Paper presented at *Connections 2007.* Drexel iSchool, Philadelphia, Pennsylvania.

Moulaison, H. L. & Corrado, E. M. (2007, April). *Analog v. Google in the CMS: RSS feeds to the rescue.* Paper presented at the 13th ACRL National Conference Baltimore, Maryland.

Barnett, J, Pile, J. & Moulaison, H. L. (2007, March). *This is the world calling: Incorporating international internet radio and TV into your collections and curriculum.* Round table presented at the 13th ACRL National Conference, Baltimore, Maryland.

Panel Discussion: Corrado, E. M., Moulaison, H. L. & Dempf, L. (2007, March). Inside/Out: Web 2.0 for Internal and External Communications at TCNJ Library. Paper presented at Technology and Library Services: Meeting Today's Users' Needs, Frist Campus Center, Princeton, New Jersey.

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Moulaison, H. L. & Weech, T. L. (2006, February). Competencies needed for librarianship in a networked society. Paper presented at the BOBCATSSS Symposium, University of Tallinn, Tallinn, Estonia.

Corrado, E. M., Moulaison, H. L. & Thul, E. (2006, January). Integrating RSS feeds of new library acquisitions into a course management system. Paper presented at the NJ ACRL/NJLA-CUS/VALEnj Conference, Rutgers University, New Brunswick, New Jersey.

Moulaison, H. L. (2005, October). Fair's fair: Intellectual property, copyright, and fair use. Paper presented at the Fifth Annual Brick and Click Libraries Symposium, Northwest Missouri State University, Maryville, Missouri.

Moulaison, H. (2005, October). The French love affair with online information systems: From the 1980s to the present day. Paper presented at the 30th Annual European Studies Conference, University of Nebraska at Omaha.

Rudasill, L. & Moulaison, H. L. (2005, June). Resources to support global studies; what we have; what is needed. Paper presented at Global Studies in Higher Education, Center for Global Studies, University of Illinois at Urbana-Champaign.

Moulaison, H. L. (2005, April). Copyright in an electronic age. Paper presented at HELIX 2005 (Higher Education Learning and Information eXchange), MOREnet Annual Conference,

[MOREnet -- The Missouri Research and Education Network Communications Dept.], Osage Beach, Missouri.

Moulaison, H. L. (2005, January). The French university library and access to information in the humanities. Paper presented at Transparent Borders: Crossing Intellectual Divides in European Scholarship, Western European Studies Section (WESS), American Library Association 2005 Midwinter Meeting, Boston, Massachusetts.

Moulaison, H. L. (2004, April). Free cataloging help from the Web: An overview. Paper presented at the Missouri Association of School Librarians (MASL) 35th Annual Spring Conference, Osage Beach, Missouri.

Moulaison, H. L. (2004, March). Copyright in the digital age: Copyright and educators. Paper presented at HELIX 2004 (Higher Education Learning and Information eXchange), MOREnet Annual Conference, [MOREnet -- The Missouri Research and Education Network Communications Dept.], Osage Beach, Missouri.

Moulaison, H. L. (2004, February). Serving the academic community here and abroad: The university library as a reflection of a culturally-implemented system. Paper presented at the Missouri Philological Association 29th Annual Conference, Kansas City, Missouri.

Moulaison, H. L. (2003, April). Free Internet cataloging resources. Paper presented at the Cataloging and Classification Round Table, Catholic Library Association (CLA) Annual Conference, St. Louis, Missouri.