

Collaborative Ownership in Cross-Cultural Educational Digital Library Design

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Abstract. This paper details research into building a Collaborative Educational Resource Design model by investigating two contrasting Kenyan / UK design case-studies and an evaluation of end-users and designers' perceptions of digital libraries and their usage patterns. The two case-studies compared are; case study 1 based on formal learning in an African university digital library. Case study 2 is centered on informal learning in an ongoing rural community digital library system which has a collaborative design model that is being designed, developed and reviewed within the UK and Africa. A small scale in-depth evaluation was done with 21 participants in case-study 1 but related to and with implications for the second case-study. In-depth user issues of access, ownership, control and collaboration are detailed and reviewed in relation to design implications. Adams & Blandford's 'information journey' framework is used to evaluate high-level design effects on usage patterns. Digital library design support roles and cultural issues are discussed further.

Keywords. Digital library design, Educational digital libraries, African Context of Use, Cross-cultural usability.

1 Introduction

Digital library end-users increasingly want control of what they use, how and when they use it as well as how it is designed. They are also becoming content creators because of democratization of content creation via the Internet [1]. Participatory design [2] and user centered design [3] approaches have for a long time supported designs of systems according to users needs. These approaches can also support the increased ownership felt by end-users in a system. However, applying these approaches can be complicated, time-consuming and expensive. Further complications can also ensue when resources, end-users and designers are separated by distance and culture. In a recent policy report for the 'American Library Association' [4], however, participatory design within digital libraries has been highlighted as an imperative. The report recommends that social networking and similar participatory tools must be tested and utilized at the core of the library.

Increasingly digital library design research has looked at the role of Web 2 applications [5, 6] in developing end-user control and ownership [7] to avoid digital libraries being ‘passive warehouses’ [8]. However, there needs to be an understanding of the underlying ownership and roles that end-users and information experts have in the design and use of these resources. In addition, only a small number of research findings have reviewed what these issues of end-user control, personalization and ownership mean within different cultures [9] and how this may change on-going support and management from information professionals [10]. There is therefore need for a model that can guide development of collaborative digital library designs that bring together end users, information experts and designers. Such a model should consider issues of ownership and roles of key players and their contexts. For educational digital libraries, such a model can provide support in merging digital library capabilities with the learning design needs.

The focus of the research reported here is on development of a collaborative educational resource model. We do this in reference to case-studies and an evaluation of two contrasting digital libraries for different Kenyan end-user communities. Both projects are at different stages in the development process thus providing some interesting insights into cultural similarities with differences in end-user engagement and control rationale. In order to understand end-users usage patterns over time in relation to the design of the digital libraries, we have used Adams & Blandford’s [11] information journey framework. This framework identifies an information journey for end-users who interact with information temporally, traveling through a personal or a team-based information journey and using different resources through the stages of their information journeys.

2 Digital Library Case-Studies

We have used two contrasting case-studies with different types of end-users in formal and informal learning environments to research on the development of a Collaborative Resource Design (CERD) model. The first case study is the traditional digital library system common in most African universities. This usually takes up the form of a hybrid system of databases integrated into existing print resources. Normally this is a controlled system which follows laid-down organizational procedures i.e. recognized classification, cataloguing and metadata schemes. Collection usually consists of licensed resources. The second case-study is a community-based information system whose design is collaborative and co-owned with an element of academic control and co-ordination.

Although the two case studies may appear to contradict each other, they help us to present a case for a collaborative digital library design model by drawing on the comparison. In addition, the two systems represent four common elements applicable for a digital library design which help us to understand the similarities and differences between the two approaches. These elements are: the end-users who in both case studies are involved in some form of e-learning (formal and informal). The second element is the information resources. The third element is the digital library experts or facilitators. The last element is the context; both case studies share a common cultural context.

As will be seen in the following sections, using these contrasting case studies allowed us to identify differences between collaborative and non collaborative digital library designs and what this implies to the success of a digital library system.

2.1 Traditional Digital Library Design

This case study is a Kenyan university library whose electronic resources comprise of over 100 databases of licensed resources, organised and integrated into the library online catalogue which is hosted in the library website (figure 1). Users are the university academic community of around 37,000 students and 1,400 academics. Access is mainly through IP authentication which means that remote access is not supported; users must be within the university network system in order to access the resources. Unfortunately, technological challenges faced by the university such as expensive and inadequate bandwidth and limited computers affect effective usage of these resources.

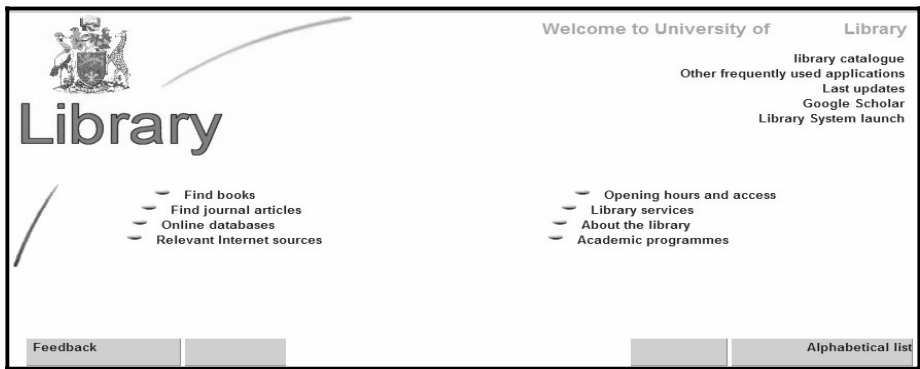


Fig. 1. University library website

Due to limited library budget, decision of what to acquire is usually made by the library. Usage of the collection is mainly polarized around academics, graduate students and final year undergraduate students. Publicity of new subscriptions is usually done through the university intranet or emails sent to the lecturers with the hope that they will alert their students. Users have limited participation in the interface design, organisation and personalisation of the collection.

2.2 Collaborative Co-ownership Digital Library Design

VeSeL (Village e-Science for Life) [12], is a research project funded by the UK's Engineering and Physical Sciences Research Council and focusing on designing technologies that are appropriate and sustainable for rural development. A group of UK based researchers partnering with the Kenyan University (case study 1) initially visited around 5 farming communities in two regions along with key players (e.g. agricultural extension workers, local middle men and private advisors). After a risk-benefit analysis, two communities were selected to work with. From the onset, the project set up to have a mutual understanding of each other's contexts and needs.

Thus the two communities were involved in the identification of their needs and technological solutions, and in the design process of the technology. The communities expressed a desire not just for acquisition and delivery of agricultural information but also for sharing this information with others. There was also the desire for local ownership of any technological solution developed.

In the following field trip the team employed ethnographic methods and interviews on the two communities' ways of living, how they interacted with existing technology and their reaction to new technologies as they were introduced to them. All the researchers involved were of African descent in order to boost cultural understanding in the whole process. Both field visits were conducted in partnership with the Kenyan University partner. The research team also explored a number of scenarios for activities with the communities, assisted by the University students. These included community blogging, water management, community mapping, agricultural and community podcasting, agricultural trails and group-based activities for community schools. However, some of these activities like the agricultural trails and community mapping were discarded almost immediately after finding them to be inappropriate in the field. Since then mobile resource kits have been deployed to communities. These support information access, capture and dissemination. The kit comprises of a Macbook laptop, solar charger and GPRS modem for internet access, digital cameras and audio recorders for capturing data. Initial training was provided around using email, blogging and posting photos and searching for information both online and locally in organic farming resources preloaded on the laptops. Follow-up training has been provided both face-to-face and remotely over Skype in response to breakdowns and requirements identified by users.

The Vesel design process was informed by guidelines derived from the concept of 'fluidity' described in De Laet and Mol's [13] analysis of the Zimbabwe Bush pump, an example of a particularly successful technology in a development context. Four principles are worth some emphasis for the purpose of this paper:

1. *Clear and Present Need*: the design process and technology to be designed should have clear value to the community, e.g. by addressing current needs.
2. *The place of the community*: Providing a role for the community in the design, on-going use and maintenance of the technology is vital to its sustainability.
3. *Ownership and access*: The community must feel that they own the technology and that it is freely accessible to them and adaptable by them.
4. *Distributed action*: Implementation of technology requires that methods and insights of the local community are paramount.

The design approach taken on by the team is one that trains end users to "take on design roles and self report their progress with the technology as participant ethnographer" [14]. For example farmers are encouraged to collect and post data from their farms as a simple blog posting, as depicted in initial sketches (figure 2). This user-generated information is later linked to an online Knowledge Management System (KMS), a kind of a Content Management System which has the basics of a digital library infrastructure.

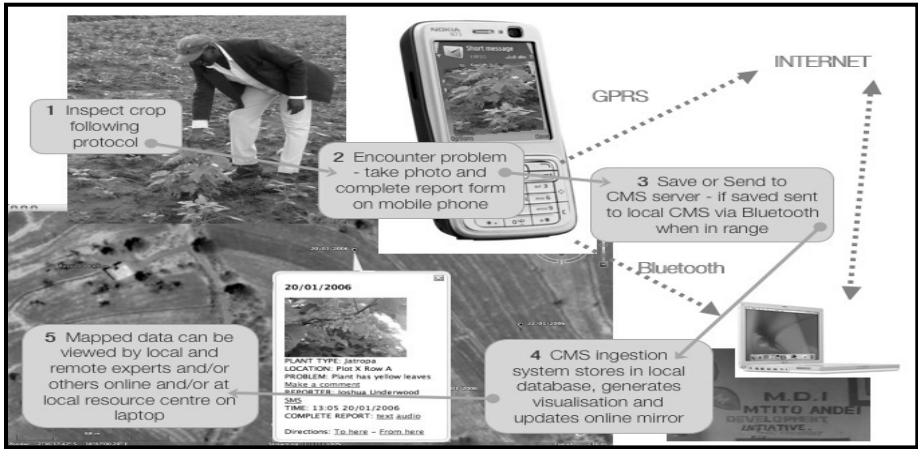


Fig. 2. Data flow and technology for resource management

3 Evaluation Research Method

A small scale in-depth qualitative study was done involving participants from Faculties of Agriculture and Computer Science in case study 1 university. 21 participants (13 students, four lecturers and four librarians) were purposefully sampled. These participants were also involved directly or indirectly in the VeSeL project described in case study 2 above. Participants' experience in the VeSeL project and use of the University library meant they had a clear concept of what was meant by digital resources within both these contexts. Their participation in the two case studies also meant that perceptions could be gathered regarding their different roles as end-users and content developers. For case-study 1 the in-depth qualitative analysis was supplemented by an ethnographic evaluation [15] with field notes on the University and its library. Relevant field documents were gathered to give a complete picture of participants' physical and temporal context and related needs. Further data were collected from VeSeL project meetings. Much of this data was fed into the background case-study details whilst some related to key evaluation issues.

3.1 Data Collection and Analysis

Formal interviews were used to get data from the students in order to understand their perceptions of digital resources. These were supplemented with informal interviews with lecturers and librarians as a way of validating the students' responses. Because of their involvement in the VeSeL project, they provided data some of which related directly to case study two as will be seen in the result presentation section. Ethnographic field notes and VeSeL project meeting notes were integrated into the analysis. Collected data was analyzed thematically in line with the first stages of a grounded theory analysis with open coding completed and synthesis of all the data into common themes. This analytic approach was preferred because it allows themes to emerge from the data, thus uncovering previously unknown issues.

Some quantitative data was also collected (Table 2) and used to further triangulate and verify aspects of the in-depth analysis. However, as the concepts, design process and research questions were predominately perceptual a qualitative nature was kept to research methodology.

4 Results

The findings from perceptions of current information and digital library usage identified interesting design issues. In general, the study established that the traditional model of the digital library design and management service provided is one-way, non-collaborative and non-user centred compared to the collaborative design approach in the VeSeL project. An overview of the impact of the design on Adam’s and Blandford’s end-users information journey (discussed further in section 5) shows that for the traditional model (non-collaborative), the three stages were distinct. However, in the collaborative model the stages were inter-related and intertwined with no distinction in resources between the three stages. This can be seen more clearly from an analysis of the resources utilised in the information journey of the two design approaches (See Table 1).

An in-depth thematic analysis of the interviews, ethnographic field data and quantitative data collected revealed 3 key issues: access and ownership, control, and collaboration. These issues were clearly inter-related and often derived from the design approach of the digital library. A review of this interaction is presented in the discussion section.

Table 1. Comparison of resources needed between traditional and VeSeL digital libraries in the information journey

	DL end-users	Initiation	Facilitation	Interpretation
Traditional DL end-users	Students	Lecturers, Peers, Coursework & books	Lecturer, Peers, books, Web Resources, Digital Libraries	Lecturers, Peers, web-resources
	Librarians	Colleague, DL email alert & bulletin, Student queries,	Digital library, Book, web-resources	Colleagues
	Lecturers	Colleague Course development, Research	Book, Colleague, web-resources, Digital Libraries	Colleagues, web-resources
VESEL end-users	community end-users	Family, Neighbours, Experts		
	resource developers	Colleagues, Content Developers, Community end-users.		
	content developers	Community end-users, Colleagues, books, web-resources		

4.1 Access and Ownership

One of the most important barriers to the traditional libraries usage related to access issues. These constraints were identified as overshadowing the users' needs. For instance, the use of an IP authentication method meant that users had no control over where they wanted to access the resources from; they were forced to be on the university premises in order to access the resources. One participant noted the following when she was asked where she accessed the resources from:

“Mostly at the university, because the university has some certain membership. So you are able to get into some libraries free of charge. Anything I have tried like from my work place, am normally forced to pay something...” Computer Science Postgraduate student

The fact that the users were rarely involved in the acquisition of resources meant a clash between the end-user demand and what was eventually provided. Most students indicated that they were not able to access the resources they needed because they did not have the right authentication. The reason for this was that the university had not subscribed full-text although students could see the abstracts from the publishers' databases. Students were not aware that this was a subscription issue:

“...we were given a print out of passwords of some resources but most of the times they were not useful to my topic... the few that were close to my topic I tried accessing them but I could not get to them.” Agricultural student

This issue was growing in importance which was verified by the usage statistics gathered for popular journals not provided (See Table 4).

Table 2. 10 most popular journals denied access due to lack of subscription license (*Source: data obtained from Wiley Interscience Publishers, 2008*)

Month (2008)	No. of cases denied
January	55
February	109
March	113
April	77
May	66

Table 2 shows that there were a large number of popular journals that students wished to access and that the library had not subscribed to. However, the study further established that this mismatch between what the students require and what is provided by the library did not deter them from using other information and digital resources. Students looked for alternative sources such as their lecturers, free resources from the internet or visited other institutions that had better access to these resources. This seemed to suggest that students have owned or have the desire for ownership of the usage process. This contrasts the approach taken by the VeSeL project whereby the information resources are open access but the communities have ownership because they have participated in developing it.

4.2 Control Issues

The study also showed that those students and academics whose IT skills were superior tended to take charge of the acquisition and usage of the resources. These participants were found to have had limited engagement with the librarians who they perceived as not collaborating with them to provide a demand driven service:

“What we have is supply driven... the demand has never spoken... We keep saying we have so many thousands of journals, how useful are they? That’s why I subscribe to mine ...” Academic

In addition, these users were self-directed and explored a multitude of different approaches that would make their information usage richer. For instance, upon discovering that there was limited local information, two students decided to create a website (<http://www.try-african-food.com/>) that would host local content and use Web 2.0 tools to share it with the rest of the world. This resource was and is constructed, maintained and supported without the aid of the library.

“It is the students who came up with this idea and said “why don’t we build our own site?” Lecturer

This accentuates the end-users’ desire for ownership, control and participation in development of digital resources.

4.3 Collaboration Issues

The initiative to design the Try-African-Food website with social networking tools highlights issues of collaboration in the design process. Users in the traditional model desired a stake in the design and usage of the digital library and because this was not available, they looked for a way out by taking charge of the process such as designing the Try-African-Food website. The presence of a blog in the website advances the end-users desire for a more collaborative and engaging process in information resources.

In contrast to the traditional digital library model, the Vesel project was identified as a more collaborative model. As was conceived at the design stage, every stake holder participated in the design of the system. Community needs were identified at the start of the project. Although these initial needs were not always captured or related accurately, an ongoing iterative approach to requirements gathering means an organic nature to the design which is continually being developed. They were involved in the design of the technology which has been identified as appropriate for solving their problems. Online spaces i.e. community and school blogs and websites were developed where the communities and school children network and exchange knowledge. This was seen as leading to the creation of an informal e-learning environment, where the communities can access knowledge that will improve their livelihood and at the same time participate in knowledge exchange with other interested parties. This entire process is highly collaborative and user-focused. However, what this evaluation has also identified is that it provides an increased sense of ownership amongst all the parties involved.

5 Discussion

Brewer [8] argues that digital libraries must be pro-active and dynamic in their support of users' changing information needs so as not to become 'passive warehouses' of navigable information. However, for digital libraries to effectively support end-users, there is a need to understand them within their context. Looking at the findings from this study in relation to the previous findings for the users' information journey helps us to understand some interesting issues around users changing needs for information control and changing roles. Adams & Blandford [11] identified a users 'information journey'; from the initiation of information requirements, through the facilitation of information to the user and finally to the interpretation and application of that information. It is interesting to see from the two case-studies that there are two completely different approaches to user needs in these different stages of the information journey. It is also helpful to use this framework as applied to an evaluation of the design of these digital libraries.

The traditional digital library model (case study 1) highlights the end-user utilizing the library with fixed needs that may develop slightly through their searching and browsing activities. This research identified problems here around issues of access and authentication. This was noted as leading to poor perceptions of control and ownership of the digital library. The collaborative co-ownership model (case study 2), however, highlights not only changing information requirements but a deeper level of control on how to formulate the information requirements (in the information initiation stage) through data collection in the field (e.g. sensors, mobile devices) and the user controlled format of the information questions (e.g. a photo of a problem with a crop).

Traditional libraries can be great at facilitating information but they provide poor support on interpreting the information received. Often the users are not supported in understanding the information given and just left to swim in it. This study established that there is limited interaction between students and librarians. Students frequently turned to their lecturers or peers to try and understand the information acquired. Lankes et al [4] argue for participatory librarianship where the librarian is at the centre of all information process roles.

However, fundamentally the librarian has still remained the facilitator of the information with no interpretation role. The support role must match the end-user's changing needs, an important consideration for the development of the CERD model.

Collaborative design (case study 2) merges facilitation and interpretation and closely relates it to information initiation through an iterative process. For example the farmer initiates an information need which could be a problem about her crop. She checks with her neighbor or an expert for facilitation of the information. At the interpretation stage, the farmers and the experts are learning from each other. The experts are checking with the farmers to see if they are meeting their information needs and designing appropriate technologies for meeting these needs. Farmers are feeding back to the process and also sharing their new experiences through use of multimedia technologies and resources. Farmers are also learning new information facilitation techniques by being introduced to social networking tools such as blogs. The experts and the communities (end users) are engaged with each other at all the stages in a collaborative process. What this study has identified is the empowering way that this in turn creates ownership of the process, the resources and the technologies. This is a vital

contribution for the development of the CERD model. The three key players in the design process must collaborate through an iterative process along all the stages of the user's information journey.

Finally, it is interesting to note that case study 2 included designers, content developers and community end-users across great distances and from different cultures. Initially there were problems with communication between these parties, but as these continued to be highlighted and dealt with they have diminished. End-users ownership has been surprisingly high regardless of these issues. Case study 1 is co-located with the end-users from a similar culture. However, the students & academics noted several poor design issues (e.g. problems with authentication) along with a lack of ownership and control. There are some clear cultural implications of these two design approaches which will need further investigation for the purpose of the development of the CERD model.

6 Conclusion

What does this new wave of digital libraries that are collaboratively designed and end-user controlled mean to the future of the information professionals, their practice and training? What are the implications for the designs of digital libraries? How does this relate to the end-users, particularly students who are self directed in their learning and are already benefitting from Web 2.0 social networking tools, and demanding a stake in the design process? Ultimately, how does this feed in to the development of the CERD model? First of all, information professionals have to step out of the traditional practice of meeting end-users' needs within the confines of current library practice. Both information professionals and educators need to refocus their services by working more collaboratively in order to make clear connections between digital resources and learners' needs as emphasized by Littlejohn et al. [16]. As seen in the study, this can best be achieved by bringing all the three players on board in the design process. A model that makes this possible and one that integrates the collaborative capabilities of the emerging Web 2.0 technologies is the recommendation of our research. Furthermore, such a model may also help to reduce cultural barriers in the usage of educational digital resources by making them more cultural specific. However, further research will be required to review this further.

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