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Proposal NO.
NPRP 4 - 029 - 1 - 007

Submitting institution information

If you are located in Qatar, the system will automatically assign your institution as the submitting institution and you will take the role of Co-LPI by default. Otherwise,you can select your submitting institution by adding the email address of your Co-Lead PI and the system will then verify that his / her institution is inside Qatar and whether the RO of that institute is approved.

Submitting Institution help video

View submitting institution information

Submitting Institution

Institution name:	Qatar University

Co-Lead PI Details

Role:	Co-Lead PI
Name:	Dr. Mohammed Samaka - Approved
Nationality:	New Zealand
Institution:	Qatar University
College - Department:	Engineering - Computer Science and Engineering
Degree - Position:	Phd/DPhil - Associate Professor
Tel. - Mobile - Fax:	009744472623 - 009745471371 - 009744472623
E-mail:	samaka.m@qu.edu.qa

Remove

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Proposal description

Please note that the information below is extracted from the LoI. However, you can edit it if required.

Proposal Description help video

View proposal description

Project title: Establishing a Qatari Arabic-English Digital Library Institute

Description of the proposal:

A digital library (DL) has computer managed collections with services tailored for its user community. Although we and others have researched and developed DLs since 1991, there is little related activity in Qatar. We will research and address needs for DL infrastructure, advancing toward the Qatar National Vision 2030, leveraging international collaboration to support an educated population and economic development.

Establishing an Arabic-English DL Institute will lead to a national community of digital librarians, guided by a tailored curriculum (incorporating our R&D findings), launched through seminars, workshops, and a consulting center. Through study of information use in Qatar, and adaptation of our advanced systems--e.g., SeerSuite, CiteSeerX, ChemXSeer, TableSeer, and Ensemble--we will integrate DL research with new information retrieval and Web techniques. We will emphasize focused crawling, information extraction, Arabic-English searching, and preservation. Our demonstration collections will contain available online information in Qatar, especially related to government (e.g., museum) and scholarly information (initially computing and chemistry related, but extending to theses as well as supplemental collections on the arts and cultural heritage).

We will develop a sustainable model for Qatar, and assemble the necessary tools to establish a state-of-the-art institute and a DL benefiting Qatar, its people, the region, and the world.

Edit

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Key investigator(s)

If applicable, state key investigators other than the Lead PI.

Key Investigator help video

* Required fields

Do you have other key investigators to add?: Click yes if other key investigators are involved (•) No ( ) Yes

View key investigator(s)

Role: PI
Name: Prof. C Lee Giles - Approved
Nationality: United States
Educational institution: Pennsylvania State University
College - Department: - Information Sciences and Technology
Degree - Position: Phd/DPhil - Professor
Tel. - Mobile - Fax: 18148657884 - -
E-mail: giles@ist.psu.edu

Remove

Role: PI
Name: Prof. John Impagliazzo - Approved
Nationality: United States
Educational institution: Qatar University
College - Department: Engineering - Computer Science and Engineering
Degree - Position: Phd/DPhil - ictQatar Endowed Chair and Professor
Tel. - Mobile - Fax: 97444034252 - 97466084010 - 97444034241
E-mail: John@qu.edu.qa

Remove

Role: PI
Name: Prof. Richard Furuta - Approved
Nationality: United States
Educational institution: Texas A&M University - College Station
College - Department: Dwight Look College of Engineering - Department of Computer Science and Engineering
Degree - Position: Phd/DPhil - Professor
Tel. - Mobile - Fax: 19798453839 - -
E-mail: furuta@cs.tamu.edu

Remove

Role: Co-Lead PI
Name: Dr. Mohammed Samaka - Approved
Nationality: New Zealand

Educational institution:	Qatar University
College - Department:	Engineering - Computer Science and Engineering
Degree - Position:	Phd/DPhil - Associate Professor
Tel. - Mobile - Fax:	009744472623 - 009745471371 - 009744472623
E-mail:	samaka.m@qu.edu.qa

Role:	Lead PI
Name:	Dr. Edward Fox - Approved
Nationality:	United States
Educational institution:	Virginia Tech
College - Department:	Engineering - Computer Science
Degree - Position:	Phd/DPhil - Professor
Tel. - Mobile - Fax:	15402315113 - 15405531856 - 15402316075
E-mail:	fox@vt.edu

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Benefit to Qatar

How significant is the envisaged outcome in promoting priority issues in areas that are critical to Qatar, the regional and / or the world community?

Benefit to Qatar help video

View benefit to Qatar

Benefit of the Project to Qatar: For Qatar to transition to a Knowledge Society, there must be effective access to and use of Qatari information, and a community of digital librarians who advance the state-of-the-art and practice nationwide. Planned research will surpass the new Saudi Digital Library (DL), and even extend work that team members are implementing for the US National Science Digital Library. The proposed institute will be launched by leading DL experts to establish a foundation for that transition in Qatar, undertaking necessary research. For example, focused crawling will aggregate collections tailored to user communities. Further, extraction will disambiguate author names, and support searching specialized to tables, citations, chemical formula, and other document elements. During the first year, a portal with advanced services will provide improved access to Qatari government and scholarly information in English. Then, research will extend these novel techniques to Arabic, and later facilitate cross-language discovery and research. Through research into scholarly practices and requirements, tailoring will proceed, oriented toward each target user community, and will be reinforced through usability testing. Seminars, workshops, and a consulting service will build on research on DL curricula, and help train digital librarians and engage them in extending Qatari collections and services.

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Resources

Resources help video

View resources

Institution:	Qatar University
Laboratory space:	Qatar University has modern laboratory facilities. Qatar University has sufficient space available so the key investigators can work to develop quality components for the project. The space will contain proper utilities, sufficient air conditioning, and broadband internet access.
Personnel:	Dr. Samaka has extensive experience in e-learning, and in curriculum development. He was the recipient of QNRF funding for several research projects. He will contribute to achieving the project's objectives, including; obtaining contents, organize workshops, and provide Arabic-English support across the community. Dr. Impagliazzo is a well-known computing educator and considered a world expert in computing curricula, accreditation, and assessment issues. Impagliazzo helped develop the National Science Foundation digital library initiative (NSDL) through its CITIDEL component for computing.
Facilities:	Qatar University has excellent facilities to ensure a successful project outcome. The campus has modern buildings. The new Women's College of Engineering building has outstanding facilities that would rival most universities in the world.
Office and computer facilities:	The key investigators at the university (Samaka, Impagliazzo) have excellent offices in the new Women's College of Engineering building. The computing facilities are excellent with wireless broadband available throughout the campus.
Major equipment:	The technological infrastructure at Qatar University is in place. The facilities can accommodate all major equipment for the project such as servers, scanners, and lockable storage space.

Edit

Institution:	Texas A&M University - College Station
Laboratory space:	The Texas A&M University work will be conducted in the TEES Center for the Study of Digital Libraries (CSDL), located on the main campus in College Station, TX, USA. The CSDL, founded in 1995, fosters pioneering research on the theory and application of digital libraries.
Personnel:	Dr. Furuta is Director of the CSDL and is one of its founding members. His research areas include Digital Libraries and Digital Humanities. He is a leader in the international Digital Libraries community and is President of the IEEE-CS Technical Committee on Digital Libraries. His research is highly multidisciplinary and includes successful collaborations with scholars from Nautical Archaeology, Hispanic Studies, and English. He is PI for the Texas A&M Component of the Ensemble project, which is implementing a portal to the NSF National Science Digital Library for all areas of computing.
Facilities:	Texas A&M University is a land-grant, sea-grant, and space-grant university. Enrollment at the 5,142 acre campus is more than 48,000 students. The Dwight Look College of Engineering ranks second nationally in total enrollment and fifth in the number of engineering bachelor's degrees awarded.
Office and computer facilities:	The CSDL supports over 100 computer systems and disk servers with over 10 terabytes of storage, connected to the campus network backbone by a hybrid gigabit and 100-megabit Ethernet network. CSDL researchers are housed in office space provided by the Department of Computer Science and Engineering.
Major equipment:	No major equipment purchases are included in the Texas A&M University portion of this proposal's budget. The project will have access to the facilities provided by the CSDL, the facilities of the Department of Computer Science and Engineering, and the infrastructure provided by the University.

Edit

Institution:	Virginia Tech
Laboratory space:	VT's Digital Library Research Lab (DLRL), a global DL research leader, is at the center of campus, usually involving 15-20 students in a variety of projects. There also is lab and space support from Computer Science, the Center for Human-Computer Interaction, and the VP for Information Technology.
Personnel:	LPI Fox, drawing on experience with >110 research projects, will lead the research, guiding PhD candidate Tarek Kanaan, who will focus on Arabic-English information retrieval (IR), and spend 3 mo/yr in Qatar. Fox will visit Qatar twice yearly, leading seminars and workshops, applying ongoing research on DL curricula. A founder of the field of DLs, with work since 1978 on IR, multimedia, and educational technologies, Fox will extend prior collaborations with Furuta, Giles, and Impagliazzo. Directing VT's DLRL, he will connect its ongoing research with efforts in Qatar.
Facilities:	VT is a comprehensive US land-grant university, with over 28K students and top-notch networking / computing capabilities. US News & World Report ranked the College of Engineering 14th in 2007. In 2008 Computer Science's graduate program was one of Computerworld's "Top 10 IT Schools to Watch".
Office and computer facilities:	VT's DLRL, with conference room, server room, and racks in the campus computing center, has 2 large servers, many small servers, and a variety of small systems. There is extensive computational, storage, and networking support. Computer Science provides additional space and administrative support.
Major equipment:	VT's locally designed and built supercomputer, System X, was ranked #3 in Nov. 2003. Upgraded repeatedly, it is one of many available clusters and servers, along with advanced visualization, human-computer interaction, storage, multimedia, etc. -- supporting research and outreach services.

Edit

Institution:	Pennsylvania State University
Laboratory space:	The College of Inf. Sciences & Technology is located in the new IST Building with over 190K sq. ft. It includes a cybertorium, instructional labs, research labs, research clusters, and administrative space. The College of Inf. Sciences & Technology has numerous facilities to assist in research.
Personnel:	Dr. C. Lee Giles is the Director of the Intelligence Information Systems Research Lab. His research areas are information extraction and retrieval, social networks, search and ranking, DLs and specialty cyberinfrastructure. He has published over 300 articles in these areas and is Fellow of the ACM, IEEE and INNS. He directs the well known academic search engine and DL CiteSeerX project and has built other specialty search engines and DLs. Past and current sponsors include the National Science Foundation, Microsoft, NASA, Ford Motor Co., Alcatel/Lucent, Lockheed Martin, and Raytheon.
Facilities:	The Pennsylvania State University is a comprehensive US land-grant university, with over 40K students and known internationally for its scientific and engineering research and education. Total research funding for 2009 was $765 million.
Office and computer facilities:	The Intelligent Information Systems Research Laboratory has nearly 100 servers with nearly 50 Tbytes of storage with many servers located in maintained machine room. The lab has extremely fast connectivity to the Penn State backbone.
Major equipment:	This effort has access to the newly funded NSF ICS cyberinfrastructure CyberSTAR which will be a scalable terascale advanced resource for discovery through computing.

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Timeline and Specific Aims

Define the Specific Aims and Tasks for this project, allocating personnel resources to each aim.

Show help video list

* Required fields

Project duration:* 36 Months

View timeline and specific aims

Add Specific Aim | Edit Duration

Aim title (1): Research and prototype digital library systems and infrastructure, for Qatar, focusing initially on Qatari information related to government or scholarly activities

Add Participant | Edit | Remove

Description: Regarding this aim, we will leverage Penn State's SeerSuite software infrastructure, implementing novel advanced systems on the proposed equipment. Our research will allow us to extend SeerSuite beyond its current focus on English to support Arabic-English collections and cross-language discovery. Starting with SeerSuite's support for content related to the disciplines of computing and chemistry, we will extend to cover a broad range of scholarly disciplines. Further, we will extend its capabilities to support all types of government information. Thus we will cover key aspects of Qatari information currently available, demonstrating how deep analysis of digital objects and collections, including extracting tables and references/citations, provides superior capabilities beyond those in commercial systems. Regarding government information, we will obtain pages, reports, and other information from all branches and agencies of the government, through web sites as well as any other database or other accessible online venues. This should include a great deal of information related to education, as well as some museum information. Initially our focus will be on automatic or semi-automatic collection development.

Duration: From: Month 1 To: Month 36

		Effort inside Qatar(days)	Effort outside Qatar(days)	
Participant Name:	Consultant-1 (Qatar University)			Edit Remove
	First Year	7	0	
	Second Year	7	0	
	Third Year	7	0	
Participant Name:	Consultant-2 (Qatar University)			Edit Remove
	First Year	5	0	
	Second Year	5	0	
	Third Year	5	0	
Participant Name:	Graduate Student-1 (Virginia Tech)			Edit Remove
	First Year	0	89	
	Second Year	0	89	
	Third Year	0	89	
Participant Name:	Graduate Student-3 (Pennsylvania State University)			Edit Remove
	First Year	0	89	
	Second Year	0	89	
	Third Year	0	89	
Participant Name:	Graduate Student-4 (Pennsylvania State University)			Edit Remove
	First Year	0	24	
	Second Year	0	24	
	Third Year	0	0	
Participant Name:	Research Assistant-1 (Virginia Tech)			Edit Remove
	First Year	46	0	
	Second Year	46	0	
	Third Year	46	0	
Participant Name:	Research Assistant-3 (Pennsylvania State University)			Edit Remove
	First Year	46	0	
	Second Year	46	0	
	Third Year	46	0	
Participant Name:	Research Assistant-4 (Pennsylvania State University)			Edit Remove
	First Year	0	0	
	Second Year	0	0	
	Third Year	0	72	
Participant Name:	Research Assistant-5 (Qatar University)			Edit Remove
	First Year	92	0	
	Second Year	92	0	
	Third Year	73	0	
Participant Name:	Dr. Edward Fox			Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	0	3
Second Year	0	5
Third Year	0	5

Participant Name: Dr. Mohammed Samaka Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	15	0
Second Year	13	0
Third Year	9	0

Participant Name: Prof. John Impagliazzo Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	13	0
Second Year	12	0
Third Year	11	0

Participant Name: Prof. Richard Furuta Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	0	2
Second Year	0	2
Third Year	0	2

Aim title (2): Research and build the digital library community in Qatar, supporting digital library use, services, collection development, tailored systems, and advancing toward the Knowledge Society in Qatar. Add Participant Edit Remove

Description: Regarding this aim, we will study scholarly activities, and engage in community building in Qatar, so DLs can be tailored to specific domains and to the unique needs of Qatar. Through workshops, a consulting center at the proposed Institute, and collaborative efforts with libraries and museums in Qatar, we will identify particular needs and uses, and tailor collections, systems, and services, to lead toward the Qatari Knowledge Society. We will extend work on social networks to collect and utilize data, allowing personalized as well as group and agency tailoring. Key communities will include citizens, educators, scholars, and students. As the DL community in Qatar emerges and becomes trained through our efforts, mastering key concepts and technologies, we will partner with the new digital librarians to add other collections, especially covering Qatari culture and heritage, beginning with key metadata.

Duration: From: Month 1 To: Month 36

Participant Name: Consultant-1 (Qatar University) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	15	0
Second Year	15	0
Third Year	15	0

Participant Name: Consultant-2 (Qatar University) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	5	0
Second Year	5	0
Third Year	5	0

Participant Name: Graduate Student-1 (Virginia Tech) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	0	10
Second Year	0	10
Third Year	0	10

Participant Name: Graduate Student-2 (Texas A&M University - College Station) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	0	99
Second Year	0	99
Third Year	0	99

Participant Name: Graduate Student-3 (Pennsylvania State University) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	0	10
Second Year	0	10
Third Year	0	10

Participant Name: Research Assistant-1 (Virginia Tech) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	20	0
Second Year	20	0
Third Year	20	0

Participant Name: Research Assistant-2 (Texas A&M University - College Station) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	66	0
Second Year	66	0
Third Year	66	0

Participant Name: Research Assistant-3 (Pennsylvania State University) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	20	0
Second Year	20	0
Third Year	20	0

Participant Name: Research Assistant-5 (Qatar University) Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	40	0
Second Year	40	0
Third Year	59	0

Participant Name: Dr. Edward Fox Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	0	1
Second Year	0	1
Third Year	0	1

Participant Name: Dr. Mohammed Samaka Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	7	0
Second Year	9	0
Third Year	13	0

Participant Name: Prof. John Impagliazzo Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	9	0
Second Year	10	0
Third Year	11	0

Participant Name: Prof. Richard Furuta Edit Remove

	Effort inside Qatar(days)	Effort outside Qatar(days)
First Year	0	9

Second Year	0	10
Third Year	0	10

Research Plan (Items 1-7 not to exceed 25 pages)

1. Background / literature survey (maximum 2 pages)

In 1991, the field of digital libraries (DLs) was launched to support global needs, as an integration of work in areas including information retrieval, database management, hypertext/hypermedia, multimedia, human-computer interaction, and library/information science [1-,4]. In 1993 this 'hot topic' [5] was identified in USA as worthy of significant funding [6], building upon a series of exploratory workshops [1]. Many journal special issues summarized key early work [2,3,6-,9], while recent encyclopedia articles review developments over a longer period [10,11]. Digital libraries are an essential part of the Knowledge Society, and require local expertise and support, as has recently been demonstrated through the launch of the Saudi Digital Library [12,13].

Some digital library initiatives have focused on a particular genre, e.g., electronic theses and dissertations (ETDs). Though ETDs had origins back to 1987, they first became feasible for widespread development in 1996 [14]. By 1997 international interest in ETDs arose [15], with clear potential for global effect by 2001 [16,17], leading to support by UNESCO across a range of languages [18]. Research on cross-language summarization [19] and resource/knowledge discovery [20,21] of ETDs built on early demonstrations of the use of concept maps [22] and evaluation of their effectiveness [23]. An even broader program of research emerged as digital libraries covered a vast array of genre, media types, topical areas, user communities, and educational levels.

To support the growing widespread interest in digital libraries, an educational framework (Fig. 1) was developed with support from the US National Science Foundation. Work began in 2006 [24] as an interdisciplinary initiative involving computer, library, and information scientists [25]. Based on study of the literature, the central core of the field was identified [26]. Connections to computer science [27] and ETDs [28] were highlighted, and an evaluation program was established [29,30,31]. Curricular modules were developed, reviewed by experts, and field tested in courses [32].

Undergirding for this curricular work includes development of theoretical foundations for DLs, such as the 5S (Streams, Structures, Spaces, Scenarios, and Societies) framework [33, 34]. 5S can help with modeling of DLs [35], to simplify the work of librarians charged with their development, using basic tools like DSpace [36]. 5S also supports integration of digital libraries [37] and assessment of quality [38,39,40]. It aids further research and development by providing an ontological basis [41].

There are many DLs serving a wide variety of purposes. They can be integrated [37] and can interoperate [42] through mechanisms like harvesting, such as with the Open Archives Initiative Protocol for Metadata Harvesting [43]. OAI-PMH has been instrumental in the support of education through DLs, as was demonstrated in the CITIDEL project [44], which involved building a collection of educational materials for computing education [45], including for distance education [46]. Research supported CITIDEL's enhancement with visualization [47] and initial support for multiple languages [48]. More recently, CITIDEL led to the Ensemble pathway project in the US National Science Digital Library, supporting communities with computing collections [49], across the many groups interested in computing [50], using an ontology to connect across areas [51] in a distributed fashion [52], building upon open source software like Drupal [53] and Fedora Commons [54]. Ensemble leverages our two decades of experience with DLs to follow key principles [55] and support social networking [56]. The Crisis, Tragedy and Recovery Network, a digital library initiative we launched to help communities deal with emergency situations [57,58], also leverages this experience, but further depends crucially

on our partnering with the Internet Archive [59]. Our team has collaborated with many other DLs, e.g., Biblioteca Virtual Miguel de Cervantes [60], which comprises the largest open-access repository of digitized Spanish-language historical texts and literature [61].

To give perspective on some of these other efforts, and to make clear the need for similar activity in Qatar, we briefly review several of the vast number of related projects and literature. For example, the World Digital Library (WDL) [62] is an international digital library with broad support, including UNESCO and the US Library of Congress. Its mission is to promote international and intercultural understanding; expand the volume and variety of cultural content on the Internet; provide resources for educators, scholars, and general audiences; and build capacity in partner institutions to narrow the digital divide within and among countries. Library of Congress Digital Collections [63] provides a gateway to a growing treasury of digitized photographs, manuscripts, maps, sound recordings, motion pictures, and books, as well as “born digital” materials such as Web sites.

Some DLs are discipline oriented. For example arXiv [64] provides preprints in mathematics, physics, computer science, quantitative biology, and statistics. The Avalon Project [65] is a digital library of documents relating to law, history, and diplomacy. The Baen Free Library [66] is a digital library of science fiction and fantasy publishing. Astrophysics Data System (ADS) [67] is a DL portal for researchers in astronomy and physics. The Biodiversity Heritage Library [68] is a project for the digitization of literature on biodiversity. The Central and Eastern European Online Library [69] is an online archive providing access to full text articles from humanities and social science scholarly journals on Central, Eastern, and South Eastern European topics. The Christian Classics Ethereal Library [70] is a DL that provides free electronic copies of Christian scripture and literature texts.

Other DLs aim to serve a particular geographic region, and the local and global researchers involved, providing significant materials that won’t be found easily. For example, the African Journals OnLine (AJOL) [71] is dedicated to improve the online visibility of, and access to, the published scholarly research of African-based academics. The British History Online [72] is a digital library of primary and secondary sources on the medieval and modern history of the British Isles. The California Digital Library [73] supports the assembly and creative use of the world's scholarship and knowledge for the University of California libraries and the communities they serve. The e-rara.ch [74] is a Swiss digital library dedicated to providing free online access to rare antique Swiss books and prints. The Florida Digital Newspaper Library [75] provides access to the news and history of Florida through local Florida newspapers. The Hungarian Electronic Library [76] is one of the most significant text-archives of the Hungarian Web space.

Other DLs focus on language related materials. For example, Aozora Bunko [77] is a Japanese digital library which encompasses several thousand works of Japanese-language fiction and non-fiction. L'Association des Bibliophiles Universels [78] is a French language DL. Biblioteca Virtual Miguel de Cervantes [60] comprises the largest open-access repository of digitized Spanish-language historical texts and literature from the Ibero-American world. The Digital Library for Dutch Literature [79] contains literary texts, secondary literature, and additional information, like biographies, portrayals, and hyperlinks in the Dutch language. Zeno.org [80] is a digital library with German texts and other content such as pictures and facsimiles.

The Qatar Digital Library will be a unique DL in that it runs across multiple languages, disciplines, genre, and eventually regions – providing state-of-the-art services and helping launch a community of digital librarians in Qatar.

2. Objectives / significance (maximum 1 page)

The research project has two broad objectives, consonant with Qatar's national vision [81] and plans [82], which the project team can accomplish by building upon our prior related research work spanning the last two decades:

A. Research and prototype digital library systems and infrastructure for Qatar, focusing initially on Qatari information related to government and scholarly activities.
B. Research and build the digital library community in Qatar, supporting digital library use, services, collection development, tailored systems, and advancing toward a Knowledge Society.

Regarding the first objective, the team will leverage Penn State's SeerSuite software infrastructure, implementing novel advanced systems on the proposed equipment. Our research will allow us to extend SeerSuite beyond its current focus on English to support Arabic-English collections and cross-language discovery. Starting with SeerSuite's support for content related to the disciplines of computing and chemistry, we will extend to cover a broad range of scholarly disciplines. Further, we will extend its capabilities to support all types of government information. Thus we will cover key aspects of Qatari information currently available, demonstrating how deep analysis of digital objects and collections, including extracting tables and references/citations, provides superior capabilities beyond those in commercial systems. Regarding government information, we will obtain pages, reports, and other information from all branches and agencies of the government, through web sites as well as any other databases or other accessible online venues. This should include a great deal of information related to education, as well as some museum information. Initially our focus will be on automatic or semi-automatic collection development.

Regarding the second objective, the team will study scholarly activities, and engage in community building in Qatar, so DLs can be tailored to specific domains and to the unique needs of Qatar. Through workshops, a consulting center at the proposed Institute, and collaborative efforts with libraries and museums in Qatar, we will identify particular needs and uses, and tailor collections, systems, and services, to lead toward the Qatari Knowledge Society. We will extend work on social networks to collect and utilize data, allowing personalized as well as group and agency tailoring. Key communities will include citizens, educators, scholars, and students. As the DL community in Qatar emerges and becomes trained through our efforts, mastering key concepts and technologies, we will partner with the new digital librarians to add other collections, especially covering Qatari culture and heritage, beginning with key metadata (e.g., descriptive data).

Achieving these objectives is of particular significance for Qatar. Other nations have been engaged in R&D in this arena for around two decades. In the region, there has been ongoing work in Egypt, and a recent rapid growth in Saudi Arabia. While libraries have for millennia been the foundation for scholarship, today digital libraries are a key foundation for the Knowledge Society. While the WWW is handy for many purposes, its growth is haphazard, and there is no easy way to apply it to focused national objectives. Digital librarians are the ones who now take charge of serving particular communities with appropriate content, so it is essential that Qatar quickly launch a DL initiative. Since leaders in the international DL scene will collaborate with Qatari experts in this venture, Qatar not only would emerge into the DL scene, but also should advance beyond others – through integration with Arabic content that is of particular interest, along with new approaches to extraction of information items (e.g., tables, chemical formula, and citations) and related metadata into catalogs and digital repositories supported by rich suites of services.

3. Preliminary data or studies.

3.1 Research and Curricular Development in Digital Libraries – Edward Fox

Professor Edward Fox, Lead PI (LPI) for this project, is one of the founders of the DL field [1]. He proposed and helped launch the ACM Digital Library [83], has had continuous funding on DL-related projects since 1991 (among over 110 funded projects, leading to over 900 papers, reports, and presentations), chairs the steering committee for the leading DL conference (ACM/IEEE Jt. Conf. on DLs, JCDL), and runs the LinkedIn DL group with over 1400 members. Since starting work at Virginia Tech in 1983, Dr. Fox has taught many courses related to this project, including graduate courses on Digital Libraries and Information Retrieval. Since space in the undergraduate program is limited, he covers multiple related topics in CS4624, the capstone course in the track on Knowledge, Information, and Data: Multimedia, Hypertext, and Information Access. Further, Fox has taught more than 70 tutorials in over 25 countries, mostly on topics related to this project. Even more closely related is work supported by the US NSF from the start of 2006 through the end of 2009 entitled "Curriculum Development: Digital Libraries". Fox led a two-university team, from Virginia Tech's Department of Computer Science and the School of Library and Information Science at the University of North Carolina at Chapel Hill, to devise a curriculum and a suite of educational modules (about 30 so far) [24-32]. These modules will provide the initial base for all aspects of training of the emerging DL community in Qatar. Additional modules will be developed and added to the project's growing Web (http://curric.dlib.vt.edu/) and WikiUniversity sites, as this project unfolds to cover particular needs of digital librarians in Qatar.

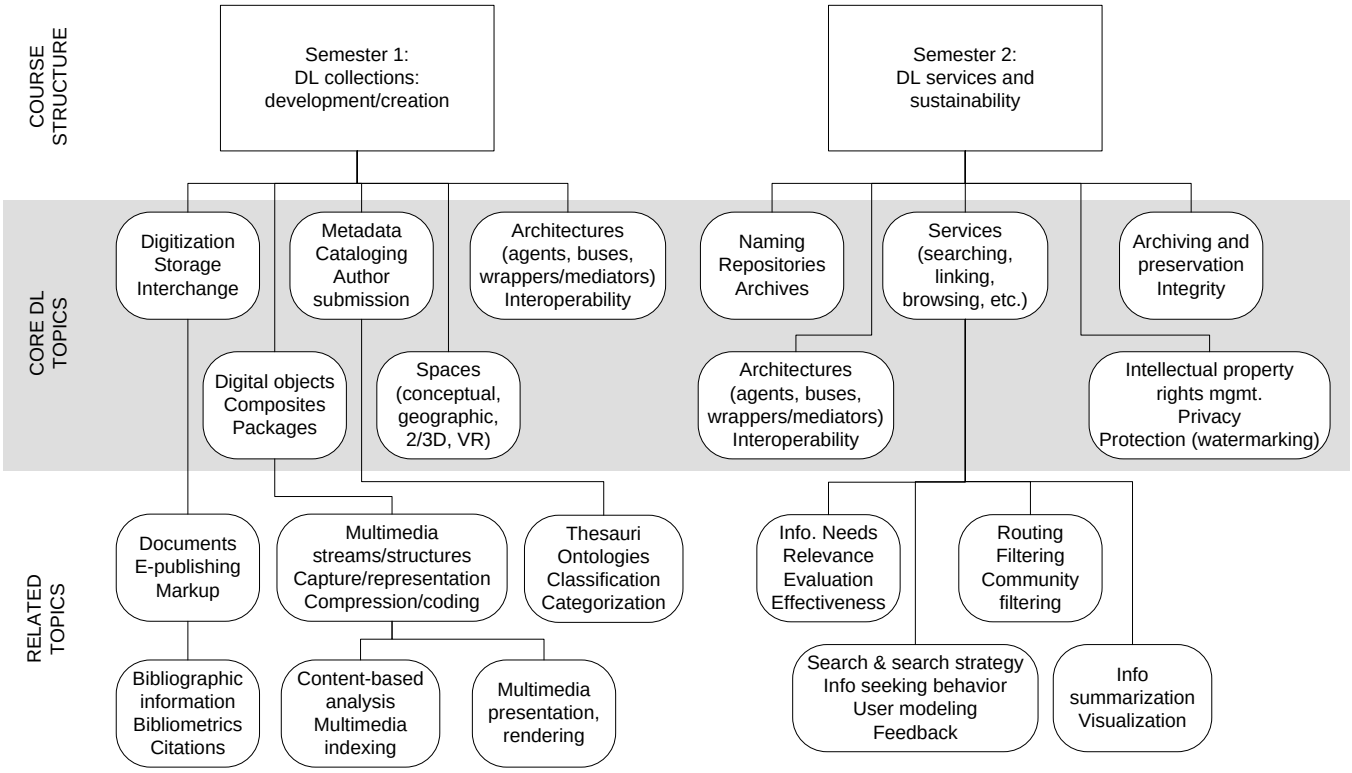

Figure 1. Digital library curricular framework, showing range of topics involved

One aspect of the work of digital librarians is collection development. In our proposed project, LPI Fox will help in this regard, having worked with a number of different types of content, including:

- Archaeological data and information [84-86]
- Biodiversity [87]
- Computing information [44-52,55,56]
- Concept maps [19-23,88,89]
- Crisis, tragedy, and recovery content (of many types, of interest to many groups) [57,58]
- Electronic theses and dissertations (ETDs, see www.ndltd.org) [14-23,88-90]
- Fish images [91]
- Physics information (hosting PlanetPhysics.org)

Another aspect of the work of digital librarians is providing services. Professor Fox also will help in this regard, having worked with a wide variety of services, including:

- Browsing [92,93]
- Clustering [94]
- Crawling [95]
- DL design [96]
- DL requirements analysis [86]
- Extraction [97,98]
- Harvesting [43]
- Recommending [99]

Other co-PIs have worked on many of these as well (plus with other content types and other services), as is explained below in this proposal.

3.2 Arabic/English Information Retrieval and Digital Libraries - Edward Fox, Tarek Kanaan

LPI Fox, who has studied computational linguistics and information retrieval for over 20 years [19,20,22,23,100-106], will supervise Virginia Tech Graduate Student Tarek Kanaan to ensure that the Qatar Digital Library embodies the latest research on handling Arabic and English, including for all of the electronic theses and dissertations (ETDs) published hereafter in Qatar. Once every Master's thesis and doctoral dissertation in Qatar leads to an ETD, and all graduate education programs in Qatar connect with digital libraries to make these available, a self-sustaining DL initiative will proceed.

There is little published literature with regard to the adoption and development of electronic theses and dissertations (ETDs) programs in academic institutions in the Arabic world [107]. Yet, with Qatar's emphasis on innovative broadband applications and Digital Arabic content, university libraries in the Gulf will have the infrastructure and impetus required to adopt and develop ETD programs [82].

A good deal of attention has been paid to digitizing cultural heritage resources, particularly Arabic manuscripts, in different parts of the world [108,109]. A number of international projects have been carried out, for example by the World Digital Library in cooperation with several international bodies, such as UNESCO, the Bibliotheca Alexandrina, and King-Abdullah University of Science and Technology. Through our project, the Qatar Digital Library will ensure better access to such content.

Three fundamental obstacles impede the transformation and modernization of information services in developing countries: the volume of material being published, its limited geographic dissemination, and linguistic barriers. Regarding volume, it is clear that Qatar is seeing a rapid increase in the

information available. Regarding distribution, delivery is improving [110,111], and the Qatar DL will provide further enhancement. Our research on Arabic/English access will help remove the third barrier. Thus, Qatar will advance beyond other educational DLs in the Arab world.

In Algeria, in accordance with a decree issued by the Ministry of Higher Education and Scientific Research in August 2000, an electronic copy of every Master's and Ph.D. thesis defended in all academic institutions must be deposited at the CERIST Research Centre. Deposit is a condition for getting the diploma. CERIST is then entrusted with the mission to build a database of Algerian theses and to update the national inventory of current theses and research. Already, from December 2001 to November 2002 a great number of ETDs were deposited [112]. In Egypt, the Ain Shams University Information Network, ASUNET, is the repository of the scientific theses published by the Egyptian universities since 1992, with more than one hundred fifty thousand bilingual Arabic and English documents, and more than ten thousand new deliveries per year. The transformation of this huge thesis library into an electronic thesis and dissertation database is an important challenge [113]. United Arab Emirates established a higher education authority to support scholarship programs for students to pursue their graduate studies abroad. Furthermore, the UAE-based universities accelerated a dynamic growth and expansion in graduate education with consequent demand for more skilled personal and research cadre. Such graduate activities inspired the UAE universities libraries to develop a special collection of the theses and dissertations that are done by UAE students, as well as those where the UAE is a research theme [114].

With a growing amount of information in Arabic, improved access will be urgently needed. Classical Information Retrieval (IR) is the sifting out of the documents most relevant to a user's information requirement (expressed as a "query"), from a large electronic store of documents. A search engine like Google performs IR by retrieving relevant web pages from the WWW. Rather than regarding foreign-language documents simply as unwanted "noise", Cross Language Information Retrieval (CLIR) allows the user to state their query in one language, and retrieve documents in another [115]. Techniques for storing, maintaining, and retrieving from English bibliographic databases have been studied, implemented, and tested since the 1960s, but much less work has been reported on Arabic data. Arabization of available information retrieval systems has dealt mostly with internal representation of the Arabic data and translation of menus and system messages to Arabic. In principle, there are two approaches to developing an Arabized computer application; the first approach is to develop the application from scratch and bear in mind the characteristics of the Arabic language. The second approach is based on adding an I/O interface to existing application software built for non-Arabic languages. The second approach is easy to implement at the price of abandoning some Arabic language characteristics; it has been adapted to Arabize two well known retrieval system software packages, STAIRS and ISIS [116]. But the first approach is better, and worthwhile.

Arabic, one of the six official languages of the United Nations, is the mother tongue of 300 million people. Unlike the Latin-based alphabets, the orientation of writing in Arabic is from right-to-left. The Arabic alphabet consists of 28 letters. The Arabic alphabet can be extended to ninety elements by additional shapes, marks, and vowels. Most Arabic words are morphologically derived from a list of roots. The root is the bare verb form; it can be triliteral, quadriliteral, or pentaliteral. Most of these roots are made up of three consonants. Arabic words are classified into nouns, adjectives,adverbs, verbs, and particles. In formal writing, Arabic sentences are delimited by commas and periods as in English [117]. There has been work on Arabic monolingual and English-Arabic CLIR [118-121]. LPI Fox will supervise Tarek Kanaan, whose M.S. thesis work was in this area, to advance beyond these methods, and to integrate them in the Qatar DL, discussed further below.

3.3 Search Engines, Intelligent Information Systems, Web – C. Lee Giles

Professor Lee Giles' research is on search engines, digital libraries, intelligent information extraction and learning systems, web agents, and data and web mining; he has published over 200 papers in these areas. Recent papers on how the web grows and on automated acknowledgement analysis appeared in the prestigious *Proceedings of the National Academy of Sciences*. His papers appearing in *Science* and *Nature* on the size of the web, and search engine coverage, were well received in the popular press, including the *New York Times* and the *Wall Street Journal*. He was co-creator of two metasearch engines, *Inquirus* and *Inquirus2*, and *CiteSeer*, the very popular specialty search engine and digital library for computer and information science literature. *Next Generation CiteSeer, CiteSeer^{x},* has been funded by NSF and Microsoft to replace *CiteSeer* [122] as an open source web services system offering advanced functionality, servicing about 2 million requests per month. He created *BotSeer*, the first search engine for robots.txt. His research has expanded to cyberinfrastructure systems for chemistry with a new chemistry search engine and repository, *Chem$_{x}$Seer*, and other disciplines such as archaeology [123], political science, and medicine. The open source toolkit for all of this, *SeerSuite*, was recently released.

3.3.1 SeerSuite

SeerSuite [124] is an open source framework developed at the Pennsylvania State University for scientific and academic digital libraries and search engines built by integrating commercial grade open source indexing (Solr/Lucene, which includes some support for Arabic) and harvesting (Heritrix) software combined with state of the art information extraction tools. SeerSuite crawls scientific and academic documents from the web and has a focus on providing reliable, robust services. In addition to full text indexing, SeerSuite supports autonomous citation indexing and automatically links references in research articles to facilitate navigation, analysis, and evaluation. SeerSuite enables access to extensive document, citation, and author [125] metadata by automatically extracting, storing, and indexing metadata [98]. Instances of SeerSuite have been the portals *CiteSeer^{x}* and *Chem$_{x}$Seer*. These bring together technologies from information retrieval and document analysis as shown in Figure 2.

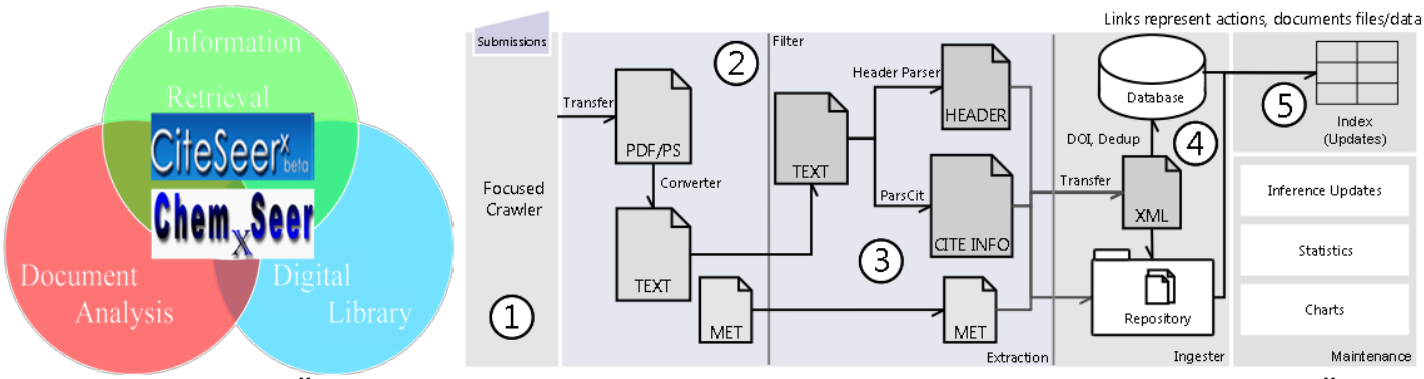

Figure 2. *CiteSeer^{x}* & *Chem$_{x}$Seer* connecting DL, IR, and document analysis; *CiteSeer^{x} flow*

SeerSuite also supports a collection of other useful features for finding and indexing information such as tables and chemical formulae. These are not usually indexed by other search tools. Relevant for computing, there also has been work on classifying computer source code in archives [126].

The TableSeer [127] component automatically finds tables in documents. As can be seen from Figure 3, it addresses a wide range of difficult problems, related to: table boundary detection, captions, footnotes, layout, orthographic/lexical features, separators, nested/spanning/missing cells, and alignments. It extracts those tables and the data that are in them into a standard XML format so that they can be used for other purposes. Table search ranks those tables according to various features such as citation count and term frequency.

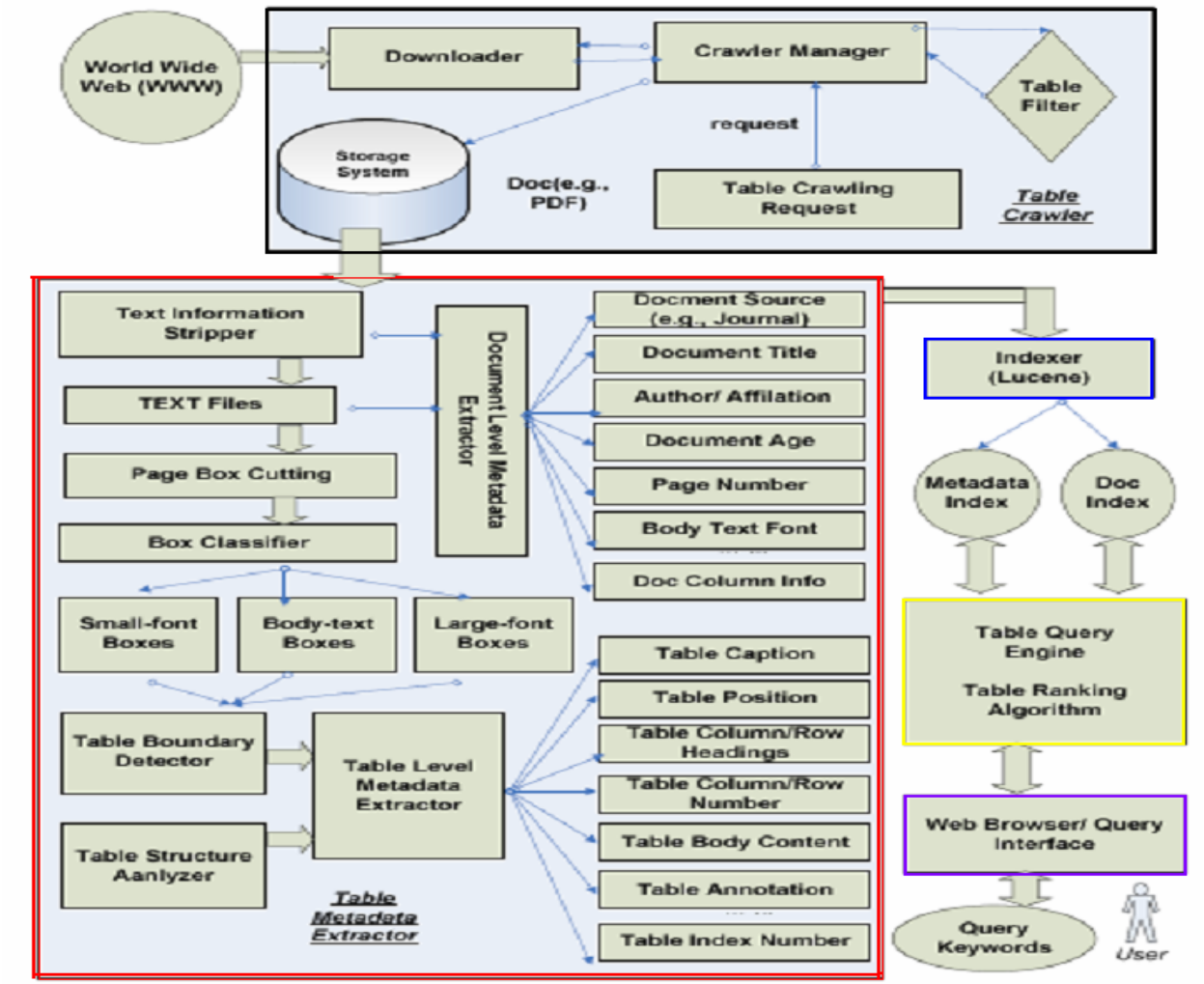

Figure 3. TableSeer System Architecture

The *Chem$_x$Seer* search tool has a chemical formula tokenizer, extractor, and ranking function which enables chemical formula and names in documents to be searched [128,129]. This tool will be integrated into the larger SeerSuite system. Current search engines and digital libraries do not yet support the above functionality, so our planned work will provide novel and powerful support for those working with chemistry, chemical engineering, petroleum engineering, medicine, and other related fields.

MyCiteSeer is a personal portal that allows users to monitor documents, store user queries, build document portfolios, and interact with the document metadata.

The above systems allow a user or users to research, design, and build a specialty or enterprise search engine and digital library for a particular community of users. We will focus these systems on addressing the needs in Qatar.

The goal of this project is to research, design, and build a special purpose search engine that harvests and includes all publicly available Qatar government and academic websites, plus sites outside of Qatar related to these sites. Further, tabular and chemical information at these sites also will be indexed and made searchable.

Research issues to be addressed include evaluation of the coverage of the information indexed both in English and Arabic, and how to measure performance, extending current information retrieval evaluation metrics such as F scores.

Furthermore, performance of the table extraction for such diverse multilingual information sources has never been measured and must be explored through extensive experimentation. The design of a multilingual harvester also will be investigated, and alternative approaches compared. Duplicate detection in the multilingual domain, while challenging, will be essential, to reduce the burden on users with limited bilingual skills.

3.4 Curricular Development in Computing – John Impagliazzo

Professor John Impagliazzo has supported many educational computing activities over decades. His accomplishments include books, contributions to model computing curricula, efforts to encourage diversity in the field, and developing a history of computing. His professional services enhanced engineering and computer science education through accreditation, conference leadership, and mentoring of colleagues. His innovative book *Computer Science: A Breadth-First Approach with C* has contributed to new methods for introductory computer science and engineering education [130]. He is a Life Fellow of IEEE and a Senior Member of ACM.

Dr. Impagliazzo represented the IEEE Computer Society on the Computer Engineering Task Force where he served as a principal co-author and as editor of the *IEEE/ACM Computer Engineering Curriculum Report* (CE2004). In addition, he was an active participant on the task force that produced the *ACM/IEEE Computing Curricula 2005 Report* (CC2005). These documents have been very influential in the development of computer science and engineering programs around the world, and have been extended to new models with broad applicability [131]. Dr. Impagliazzo currently serves as the editor-in-chief of the new magazine *ACM Inroads* and he was the editor-in-chief of the *SIGCSE Bulletin* (a publication of the ACM Special Interest Group on Computer Science Education), a position he had held continuously since 1997. He is an associate editor of the new five-volume Wiley Encyclopedia on “Computer Science and Engineering”, published in 2009. He chaired the International Federation for Information Processing (IFIP) Working Group 9.7 on the History of Computing from 2001 to 2007. He edited or co-edited conference proceedings from various conferences on the history of computing and education. Dr. Impagliazzo recently published the *History of Nordic Computing 2* (HiNC2) with Springer. He is developing two other history books on *History of Nordic Computing 3* (HiNC3) and *Perspectives on Soviet and Russian Computing*, to appear as Springer publications in 2011.

Dr. Impagliazzo will apply his expertise in computing education to help ensure there is a rapid, effective, and sustained development of a DL community in Qatar, which can collaborate effectively with those in the computing as well as the library and information science fields.

3.5 DLs in context—social media's role in DLs and multicultural applications—Richard Furuta
Dr. Furuta has been involved in the digital libraries community since the early 1990s when he was an organizer of DL94 and DL95—two pioneering conferences on the then emerging area of digital libraries. Texas A&M University has built a community of researchers studying digital library topics, reflected especially in the Center for the Study of Digital Libraries. This team regularly offers graduate-level courses specifically on digital libraries (CSCE 675) but also on related topics such as Hypertext/Hypermedia, Computer-Supported Cooperative Work, Information Retrieval, Computer-Human Interaction, and Intelligent User Interfaces. Dr. Furuta serves on the steering committee for the ACM/IEEE-CS Joint Conference on Digital Libraries, as an Editor-in-Chief of the Springer *International Journal on Digital Libraries,* and as Chair of the IEEE-CS Technical Committee on Digital Libraries.

Dr. Furuta's research in the digital libraries area has encompassed a number of projects that also are included in the general area of Digital Humanities [132,133]. These include presentations of early editions of the work of Cervantes [61] and of John Donne, a virtual catalog of artworks by Pablo Picasso, and the support of Nautical Archaeologists studying wooden ships [134]. He has had a number of projects associated with the NSF's National Science Digital Libraries (NSDL), including focused research projects on contextualization and presentation of Web-based materials (Walden's Paths) and as part of the collaborative effort towards a portal for all computing fields (Ensemble).

Living and working in a dynamic knowledge society requires deep awareness and access to the best contents and real-time research results, to assist and improve strategic decision-making. However, while the success of digital libraries increases the materials available to the scholar it also increases the complexity of the scholarly research environment. In this, locally-generated digital libraries serve as a reflection of the frequently-noted global explosion of information—more than 25,000 peer-reviewed research journals exist worldwide, across all disciplines and languages, publishing about 2.5 million articles per year [135]. Filtering and discovering the best results in a short time can be like finding a needle in a haystack.

Traditional libraries provide services to their users while prohibiting them from contributing, and most early digital libraries adopted this viewpoint as well. This results in a considerable loss of external knowledge. However, the current state of the art is moving toward two ways of interaction, where users both can benefit from the available knowledge and also can contribute to it. Digital library contents moved from being accessed by isolated databases, to more social and collaborative environments. Instead of being limited by only storing content, personal copies, and notes in a personal computer or server, researchers are moving to share and annotate links to their favorite research content on the cloud. Social bookmarking sites for researchers [136,137] or the so-called social reference management communities (e.g., CiteULike [138] and Mendeley [139]) have gained visibility in the past few years and are playing a significant role in the conduct of research. With these sites reaching thousands of users and containing millions of scholarly bookmarks, retrieving the best results by searching and browsing is no longer the most effective and efficient way to find relevant information. Beyond increases in effectiveness in finding resources, social bookmarking helps users to become aware of all relevant information that is available.

Conducting comprehensive research in this era requires having the tools that support the researcher to discover new content and know the related papers, methods, and techniques to select and use. Algorithms are being designed and developed to suit the scholarly community needs such as filtering

and discovering items of interest [140,141], connecting with like-minded researchers, and getting recommendations based on their digital libraries content and related work [142]. Other efforts have been directed to reduce web spam and redundancy [143,144] – that started targeting more specific communities, such as the scholarly world, and introduced a variety of features to fight spam in social bookmarking systems. We have investigated the precision outcomes of a hybrid bibliography system created by an online digital community to support the creation of scholarly bibliographies [132]. Our experimental results indicate that using online reputation based social collaboration would improve the quantity and usage of scholarly bibliographies, and improve the quality and creditability of social citations sites.

Studies have been conducted in many disciplines to understand the information needs and scholarly activities of researchers, scientists, university professors, and students (undergraduate and graduate) [145-154]. Many of these studies focused on trying to enhance the ability of librarians to effectively provide services such as information literacy instruction and research assistance in conjunction with advisors [155-160]. Results from the last few years show dynamic changes in scholars' information needs and behavior. Most studies were limited on a single campus, monolingual and unicultural. Furthermore, most did not consider opportunities and challenges of the social web, or were before its emergence; there were no, or limited, ways of sharing, collaborating, connecting researchers, and discovering and recommending content.

Most studies showed that researchers are not aware of or familiar with some of the resources, services, and electronic search tools available to them through the library, and generally do not consult librarians regarding their information needs [147,151,161,162]. Part of the difficulties encountered by researchers in using resources appears to stem mainly from a lack of training [163]. The findings in [162] indicate that guidance in the use of library resources and services is necessary to help students meet some of their information requirements. The study found that journals, library books, and textbooks are the most popular sources of information for course work and research, and that students need to be taught how to use available library resources and services.

In [164] a multi-disciplinary study explored graduate students' information behavior related to their process of inquiry and scholarly activities. They found that their skills and decisions are influenced directly by professors, other students, librarians, and Internet usage. Other results were that the lack of sophistication in finding and using resources and course requirements affect students' information behavior, and that findings vary across disciplines and between programs. In addition, some graduate students mentioned influences such as difficulty locating information, or the need for convenience and speed.

Hoffmann et al. [165] found that graduate students wanted to learn about strategies for finding information, bibliographic management tools, and tools for keeping current with scholarly literature. Students preferred online instruction, although in-person workshops also were found to be valuable.

The authors of [166] created literature review workshops to serve graduate students from a wide range of subject disciplines at a point of shared need. They identified some of the gaps graduate students have in their knowledge about library services.

A comparative study [167] investigated how graduate students from diverse ethnic groups discover, select, and use various information sources. The study sought to obtain insights into the information-seeking behavior of international graduate students in the United States, especially similarities and

differences compared with the information-locating patterns used by their American peers. The results of this study demonstrated that the impact of language/culture communication barriers and technology barriers on the international students' access to libraries has decreased. However, knowledge gaps still exist. Our proposed DL Institute will both study and support the current and emerging scholarly needs in Qatar.

3.6 Infrastructure Support: Computing, Communications, Conferences – Mohammad Samaka
Over the past twenty-five years of his academic career, Dr. Samaka served on the faculties of universities in different countries including Iraq, Jordan, Malaysia, New Zealand, the United Arab Emirates, and currently in Qatar. His academic services at these universities are numerous. For example, he has supervised and tutored students in a variety of basic and advanced topics related to computer science and engineering. He has participated in effective research, written books, published papers in recognized journals [168], supervised computing laboratories, provided technical advice to staff and faculty members, prepared course curricula, contributed to a variety of essential academic committees, and developed liaisons with industry. Additionally, he has been engaged in managerial positions such as deputy dean, program chair, and coordinator of committees at both university and community levels.

He has worked on wireless technologies [169,170], wireless networks [171], and mobile learning [172]. He has assessed quality of web-based systems from a user-centric perspective [173], which is of particular interest in this project. Since we expect significant transformation as the DL community emerges, his work on business process reengineering is especially relevant [174]. He also has significant experience in enhancing education, working with portfolios [175], problem based learning [176,177], and curricular standards [178] – these will be valuable to aid our seminars, workshops, consulting center, and community building.

As a member of two joint task forces involving UNESCO and the Qatar Foundation, he has contributed to the Conference of Global Literacy (March 2007) and to the Conference on Innovation in Education (April 2006) where he made a presentation on "Collaborative Education in Support of Students Empowerment". He also has been involved in many research projects with industry, particularly with Qatar Telecommunications (Qtel), and with e-government projects. These projects have stimulated other activities such as helping students find employment at governmental and industrial organizations, contributing to college and university committees, contributing to the development of a new wireless research center, helping create a degree in information systems, and maintaining connections with organizations relevant to teaching and research such as Qtel and ictQATAR.

With regard to scholarly service, he was the recipient of funding for several research projects: two from Qatar University and three others from the Qatar Foundation-QNRF. In addition, he has contributed to organizing international conferences and participated as a reviewer for many journals and conferences. Furthermore, ABET appointed him as a worldwide program evaluator for computer science programs that seek accreditation.

3.7 Collaboration in the US National Science Digital Library – Fox, Furuta, Giles, Impagliazzo
Four of the PIs in this project have worked in a variety of collaborative efforts connected with the development of the US National Science Digital Library (NSDL), which will inform work in this project, especially that connected with collections related to education or scholarship.

For example, Drs. Fox, Giles, and Impagliazzo worked on the CITIDEL (Computing and Information Technology Interactive Digital Educational Library) project starting in 2001 [44-48,].

One of a number of successors to CITIDEL is the current Ensemble project, in which PIs Fox and Furuta are currently collaborating [49-52,55,56]. A key part of Ensemble is utilization of an ontology for computing, which Dr. Impagliazzo has helped develop [179]. Other NSDL related research has included studies of syllabi and personalization [97], and building tools for educators to assemble sets of resources for sharing with others (Walden's Paths).

The PIs in this project will build upon these efforts, and other professional collaborations (e.g., Drs. Furuta and Fox leading editorial [7] and conference activities since the start of the DL field). The team proposing this work will be able to smoothly coordinate and to comprehensively meet the diverse needs related to launching DLs in Qatar, as is explained in the next section.

4. Research design and methods.

Our aim is to transform the use of information in Qatar, moving toward a knowledge society, in accord with the Qatar National Vision 2030 [81]. The following ten scenarios illustrate our expected results:

1. A Qatari assistant librarian has worked in a local primary and secondary school library since graduating from Qatar University's library studies program (now closed). One of the 10th grade teachers assigns a family oral history project to the students each year. The assistant librarian works with the teacher and students to collect the written histories and add them to a collection in the school's digital library. Because of the results of this project, the documents serve to create a history of family life in Qatar, and as models for the following year's class.
2. A Qatari industrial engineer, now a project manager for Qatar Foundation Capital Projects division, stores project notes, plans, communications, maps, schematics, and other documents in the unit's digital library. The project results will enable workers to search online, which replaces an otherwise tedious manual process of locating the paper files which are stored in offsite archives.
3. A Qatari communication student at Northwestern University uses the campus digital library established by this project to collect his student projects in an online portfolio. He plans to send links to his broadcast production videos to *Al Jezeera News* when he applies for a summer internship.
4. Qatar University's Environmental Studies Center uses a digital library developed by this project to publish online versions of its books, brochures, and quarterly bulletin *Alrkiat,* along with other publications, to broaden the dissemination of information, previously limited to print distribution.[1]
5. A tourist wants to visit Qatar to watch World Cup 2022 soccer games and so wants to learn about Qatar regulations, maps, tourist areas, lodging, transportation, etc. He will search for governmental and other related information online, from one portal, in both Arabic and English.
6. During the World Cup 2022 in Qatar, a group of international researchers whose interests (e.g., history, culture, religion) focus on the Middle East would like to learn more regarding Qatar and how the country was transformed in such a short period of time. They need to know what has been done in the last dozen years, and seek to find and meet faculty in Qatar who share the same interests. The Qatar DL will connect both researchers and content.

[1] Now, only the cover image of the quarterly bulletin is viewable on the website: http://www.qu.edu.qa/offices/research/esc/index.php

7. A Qatari science student hopes to excel in his research papers, lab projects, class assignments, and term projects. His English is not very strong, so he issues queries in Arabic, confident that the integrated monolingual and cross-language information retrieval in the Qatar digital library will find works in both Arabic and English. He finds some promising new methods in recent electronic dissertations, and some useful information tables in a Master's thesis and a chemistry article. He uses citation and chemical formula search to find even more papers.
8. A group of students in Qatar (locals or internationals) started their graduate school in one of the Qatar universities. They would like to know in real-time the current research being done in Qatar. The Qatar DL serves as a handy starting point to prepare their literature review since it allows them to search and summarize thousands of ETDs and publications prepared in Qatar.
9. The Qatar Foundaton would like to know in real-time the worldwide research impact of the research conducted in Qatar to assist in decision-making. They would like to identify the influential publications, emerging trends, strong areas, and countries that are interested in the local research produced. They prepare a report showing how these change over time.
10. It is 2030, and Qatar became a leading country in the world [179]. Political science students, policy-makers, historians, and the public want to know what the Qatari government has done during the last 20 years. They seek a comprehensive set of documents, announcements, plans, and reports. The Qatar DL has preserved these and other parts of Qatar's heritage, ensuring that they continue to exist and can be accessed in the years to come.

As can be seen in Figure 4, DLs cover the information life cycle, and should manifest quality in all their aspects, serving as advanced information systems with a focus on community, content, and appropriate services. Any type of content of interest to the target community can be managed. Our project will cover this full life cycle, and ensure high quality in the Qatar Digital Library.

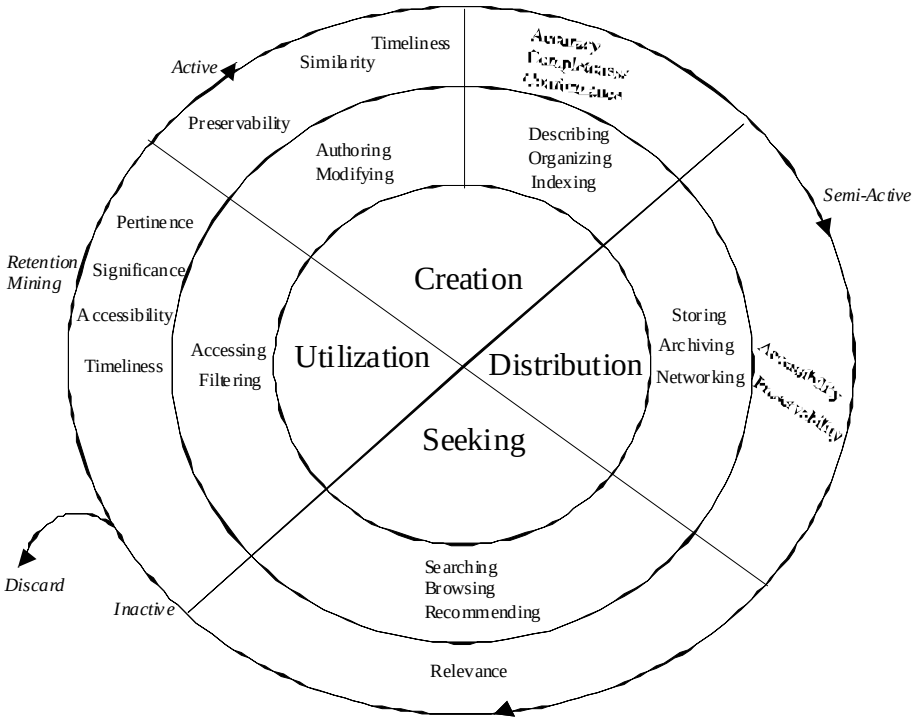

Figure 4. Information Life Cycle, along with quality measures (in outer ring)

Figure 5 summarizes the planned research for the project. Most activities are spread over the three years; comments have been added in cases when work will occur mostly at a particular stage of the effort. The discussion that follows gives further details.

1) Research and prototype digital library systems and infrastructure, for Qatar, focusing initially on Qatari information related to government or scholarly activities.

Purchase, install, configure, setup, and maintain main server software & services – most yr1

Purchase, install, configure, setup, and maintain digitization software & services – most yr 1

Implement Qatari versions of CiteSeer, SeerSuite, TableSeer

- tailor to Qatari content in English – most yr 1
- extend to work with Arabic – most yrs 2,3
- extend to work with Arabic and English together – most yr 3

Develop collections

- related to government information: web sites, agency collections, museum collections
- related to scholarly information
    - computing, chemistry, online educational resources
    - dissertations, theses, reports
- supplemental collections
- crawl in English, and also in Arabic

2) Research and build the digital library community in Qatar, supporting digital library use, services, collection development, tailored systems, and advancing toward the Knowledge Society in Qatar.

Curriculum tailoring and development

Seminars and Workshops

Consulting center

Requirements (information, services), use, usability

Supporting community efforts of collection development (collaboration) – most yr 3

- crawling based, database conversion, collection analysis
- digitization

Evaluation

Figure 5. Activity Details and Timing

4.1 DL Systems and Software

4.1.1 Main Server

A large server (see Appendix 2) will be procured and used in this project. Since it has multiple processors and flexible system software, separate R&D and production systems will be operated. While it will have sufficient capacity to meet project needs, team members also are exploring the use of cloud computing to address future scalability requirements [180].

4.1.2 Digitization Facility

While the bulk of the work of the project will make use of existing digital content on the WWW or in databases in Qatar, with automatic crawling and processing using the above mentioned server, part of the community building effort will prepare future digital librarians for occasional small supplemental efforts to address content not yet in digital form. So that digital librarians in Qatar can be trained to develop DLs in their respective areas, to support some of their needs it will be necessary to convert paper and other forms of content into some digital representation(s). Thus, a digitization facility is needed for use during seminars, workshops, and when project staff will operate the consulting service of the Institute. This will give support for scanning and audio capture, for example.

4.2 DL Collections from Crawling

4.2.1 Focused Crawling [181]

A great deal of information is available online in the Internet. Much of it is available through the World Wide Web. To aid access to that information, companies like Google and Yahoo! run crawlers, to capture and then index as much of the Web as they can reach. While there are scalability issues in this regard, this task is relatively straightforward, in that once one captures a given Web page, one should follow all the links on that page so crawling will proceed to include all those pages referred to.

To build a focused collection, so that a community can be served with content on a particular topic, a different approach is needed. Instead of indexing every page pointed to by a page that was previously identified, indexing should proceed only on those pages related to the topic of interest.

Advanced methods will be developed to crawl content in Qatar. Part of the challenge is accurately classifying a page to see if it relates to a particular topic.

This approach will lead to separate collections, as well as sub-collections, initially as follows:

- Government information
  - Educational resources (as in the US National Science Digital Library)
  - Government offices and agencies
  - Government museum information
- Scholarly information
  - Chemistry (as in *Chem$_x$Seer*)
  - Computing (as in CITIDEL, Ensemble, and CiteSeer^x)
  - Electronic theses and dissertations (as in NDLTD)
  - Other educational resources in all disciplines (at colleges and universities, as well as in corporate offices, not included in the government information)

4.2.2 Text Analysis and Extraction

Most search engines today utilize two kinds of information, the full text of items (e.g., documents or web pages) and the links connecting those items. The full text is indexed and used largely to match with short queries entered as strings of words. Key to providing better as well as additional services in

this project is more detailed and in-depth analysis of texts, leading to identifying and extracting data that reflects a deeper understanding of the information available.

For example, building upon prior work funded in connection with the US National Science Digital Library [97], as we develop a collection of educational materials, we will identify syllabi, and extract key descriptive data (i.e., metadata) about the courses involved (e.g., course number, course name, instructor(s), institution, department, date offered, textbook(s), learning objectives, assignments, and grading).

Considerable more work is needed to perfect further the methods discussed in Section 3.3, and to apply them to the collections of information in Qatar. For example, with regard to enhancing the capabilities to handle tables, the following will be researched:

- Improving the performance of the metadata extraction and ranking algorithm
    - Applying machine learning methods on table structure decomposition
- Table understanding (semantically)
- Table similarity analysis
- Table distance measurement
- Table recommendation system
- Applying tables into document summarization
- Applying table analysis into document classification and clustering
- Extending to other document components
    - Mathematical equations
    - Biomedical and health information
    - Chemistry formula
    - Figures

These enhancements will make our digital library even more effective than the current advanced methods we have developed. They will allow sophisticated support, as is illustrated in the following scenario:

> A government inspector wants to compare the data in three different reports on oil production for different wells. However, the data are in tables throughout these documents. Using TableSeer and the results of this project, the tables are found in the document and the table data is extracted into a database for comparison and easy use for building a summary document and summary table. Normally, the inspector would do this manually, leading to transcription errors and considerable delay.

4.3 Supplementary DL Collections from the Emerging DL Community in Qatar

The first objective of this project is to research Qatari information related to government and scholarly activities, including education information and some museum information. While the initial focus will be on automatic or semi-automatic collection development, the project and Qatar would be well served if the project also included supplemental collections consisting of non-automatic material. Such a sampling would complete the spectrum of data collection useful in supporting research and the long-term interests of Qatar.

4.3.1 Open source initiative

Serendipitously, Qatar's Supreme Council on Information and Communication Technology (ictQATAR) recently announced that it would strive to make Qatar an open source country [182]. This proclamation is a major twist in ICT operations in the country since the pattern to date has been to buy turnkey systems and applications to fulfill the country's needs. These systems and solutions are generally from the Western countries, designed to solve the problems found in those countries, and not necessarily a proper fit for Qatari or Arabic needs. With this information as a backdrop, one should know that Qatar has very loosely connected entities when it comes to information and document preservation, particularly in the area of historical and cultural preservation.

4.3.2 Supplemental non-textual collections

In this regard and as a supplemental purpose, the project also seeks to develop a collection that samples the various aspects of said preservation. This research effort seeks to explore non-text artifacts to enhance the textual research and collection in an effort to preserve the heritage and culture of the country and its people, and to offer a basis for related research. Examples of the sampling might include areas such as Qatari art, literature, music, sports, politics, and education from both an historical and contemporary perspective. Museum collections would fall under this rubric. Appropriate metadata would document each item and serve as examples of the varying types of description that the builders of new digital libraries in Qatar may want to employ. While it is beyond the scope of this project to engage fully in this activity, a sampling of some of these materials would not only serve the people of Qatar, but also become a model for other efforts and demonstrate the potential of this project that could be extended into future research.

4.4 Curriculum Tailoring

Education, supported by ongoing research, will be essential if Qatar is to develop the intellectual infrastructure to move toward the Knowledge Society, in accord with the Qatar National Vision 2030 [81]. The project team is made up of educators, both inside and outside of Qatar, with experience covering computer science, information systems/science, and all of the areas related to DLs. As such, they have almost 100 years of cumulative experience guiding learners to successful outcomes, which they will bring to bear to tailor DL curricular materials to the needs of Qatar. Building upon the base discussed in Section 3.1, and fitting into a coordinated program of seminars, workshops, consulting, and mentoring (see Section 4.6), education will be made to fit the varied needs of those in charge of, or staffing libraries, museums, documentation centers, and websites, as well as others who will help build Qatar's future intellectual infrastructure. Our study of the needs in Qatar, explained in Section 4.5, will guide this tailoring.

As it evolves, the DL curriculum will be adapted to serve the needs of individuals, teams, groups, classes, and a variety of organizational structures (e.g., government offices or corporate departments). Parts of the curriculum will be integrated into computer science education programs. Modules may fit into chemistry, chemical engineering, petroleum engineering, and education courses. Library and museum staff will engage in related training for professional development, and to allow them to undertake digitization efforts.

To add to the set of modules illustrated in Figure 1 and discussed in Section 3.1, as well as ten new modules developed at Virginia Tech at the end of 2010 that integrate cloud computing with learning about advanced DL software packages, new modules will be developed to fit with planned development and system enhancement research. These will cover SeerSuite, *CiteSeer*^{x}, *Chem*$_{x}$*Seer*, TableSeer, Drupal [53], Fedora Commons [54], and other applicable tools and systems. There also will be specialized modules to help with the use of the equipment and services described in Section 4.1. As new curricular modules are developed, they will follow the refinement and enhancement program perfected through our earlier work, including review by experts and field testing in courses [32] as part of the evaluation [30,31].

4.5 Electronic Qatar Research Advisor (EQRA): Augmenting the scholarly research community in Qatar through a collaborative research model

We will investigate how changes in the tools available to research communities addressing the use of social media can be used to the benefit of researchers in Qatar, supporting their overall research progress and outcome. Our research questions include:

- How do researchers prioritize, read, and manage their information sources? How do they find new content, high impact content, and emerging trends, and decide on futuristic opportunities? Have social tools influenced the literature review process?
- Can advances in social technologies augment social comparison and encourage competition and collaboration among researchers? How can they stimulate and nurture novice researchers to become expert scholars? How can they be used to promote the research culture in Qatar?
- How can we harness social knowledge in research communities? How can the research skills, knowledge, and lessons acquired by a single research project be spread and transferred to other researchers in Qatar, the region, and the world?
- How do cultural differences and educational background affect the research processes, especially among collaboration between different universities from different countries and cultures. What are ways to overcome the obstacles if they exist?
- Can specific techniques be adapted for use in the Arabic scholarly context? Can Arabic studies and content benefit from the social research web? How successful would an Arabic content recommender system be? Can visualization influence research progress? Can we reduce the task completion time and increase the productivity on research related tasks? Can we develop a prediction system that serves dynamic research needs?

User studies will be conducted with surveys and interviews in a semi-structured manner using open-ended interview questions. Based on the results from the international research community that is using social research tools, and from examining the practices currently in use in US and Qatar universities, we will develop a collaborative research model of dynamic strategies. Experiments will be conducted to measure the effectiveness of the applied strategies. Our aim is to improve and speed the scholarly process in Qatar and the world, which will have a direct effect on making Qatar universities lead the research efforts in the region, by contributing directly to Qatar Vision 2030 [179] and moving to a knowledge based economy.

4.6 Community Building

As can be seen in Table 1, we will run seminars and workshops to help build community.

Table 1. Community Building Activities

Activity	Seminar / Duration	Workshop / Duration
Overview of digital libraries – basic key concepts	Half-day	
Exploration of world digital libraries – browse and become familiar with current online collections and resources		Half-day
Introduction to digital library software and resources – look at resources such as *CiteSeer*^{x}, *Chem*$_{x}$*Seer*, TableSeer, Drupal [131], and Fedora Commons [132]	Half-day	
Introduction to description of resources – building metadata		Two Half-day
Setting up an open source digital library (SeerSuite)	Full-day	
Project design – how to plan your digital library collections		Half-day
Project management skills for collection building		Half-day
Digital libraries and Web 2.0 technologies (blogs, wikis, online publishing)		Full-day
Overview of digitization concepts	Half-day	

These activities will greatly enhance the general interest of digital libraries within Qatar to research and preserve its various forms of documentation and to serve its people.

4.6.1 Outreach and Auxiliary Services

Many community services emerge from this project. Local project participants will survey museum, library, government, ICT, and other organizational staff to identify needs and build communication and connection. Local project participants will provide advice in selecting digital library software, provide assistance in identifying resources suitable for collections, and recommend resources regarding best practices in digital library creation and maintenance. They also will build a resource website with links to international best practices and standards. Among other activities, local participants will advise museum, library, government, ICT, and other organizational staff on an ad hoc basis to support digital library efforts.

In addition to these services the project will create communication channels for digital library administrators, collection builders, and others to aid mutual support and self-reliance in Qatar. Through its local participants, the project intends to announce regional or international meetings, conferences, and resources of interest to spark a sense of involvement in the global efforts in the creation and maintenance of digital libraries. It also will sponsor meetings and networking events that allow interested persons to meet each other and talk about their ideas and projects.

4.7 Project Management – Staff Roles

As part of the proposed project, Dr. Impagliazzo would be the overall supervisor for the project at Qatar University. He will contribute to the support of the project objectives and help disseminate and develop outreach efforts within Qatar and beyond. He also will monitor and help coordinate the efforts between Qatar University and the collaborating institutions.

As part of the proposed project, Dr. Samaka would have responsibility for activities surrounding the two main objectives for the project. He will contribute to the project from its inception to its conclusion, and assist the lead investigators in managing all technical contributors. He will contribute to the design and development of the digital library project activities, assist in obtaining content, help organize workshops, and manage local budget activities. In addition he will provide Arabic-English support across communities for more effective services with the digital library project.

In addition there are two consultants. Elsewhere in the proposal documents they are referred to using their roles, i.e.:

Consultant-1: Carole Thompson (library expert)
Consultant-2: Susan Lukesh (evaluator)

For additional details about them, please see Appendix 1.

Building on her extensive library expertise, Carole Thompson will contribute to the project by guiding digital librarians in Qatar in the creation and enhancement of supplementary collections (see Section 4.3), and on expanding DL community development.

Susan Lukesh will be the project evaluator. More details on evaluation are given in Section 5.

Also at Qatar University will be a Research Assistant (-5), working ½ time throughout the project.

Each of the three US sites, for each of the three years of the project, will have a graduate research assistant working 9 months in USA and 3 months in Qatar. In the USA, they will work the usual GRA hours, i.e., 20 hours per week, meaning 99 days per year. In Qatar, they will work full-time, leading to 66 days per year. Elsewhere in the proposal documents they are referred to using their roles. When in USA, they have the role of Graduate Student. When in Qatar, they have the role of Research Assistant. Please also note that a second GRA will work at Penn State. Since funds are limited, this will be a ½ time assignment, i.e., 10 hours per week, and only for one of the two semesters (i.e., spring), and this student will not travel to Qatar, so will only have the role of Graduate Student. In addition, a Penn State undergraduate student will be paid on wages, and referred to as a Research Assistant, working at Penn State only. The following list summarizes the students and their roles:

Graduate Student-1: VT GRA working outside Qatar (and as Research Assistant-1 in Qatar)

Graduate Student-2: TAMU GRA working outside Qatar (Research Assistant-2 in Qatar)
Graduate Student-3: Penn State GRA working outside Qatar (Research Assistant-3 in Qatar)
Graduate Student-4: Penn State 2nd GRA, working only outside Qatar (1/4 time)
Research Assistant-4: Penn State undergraduate researcher, on wages, only outside Qatar

Lead PI Fox will manage the overall project. In addition to his work at Virginia Tech, he will make two trips to Qatar each year, coming for a week at a time, probably in January and in late May. These two weeks of concentrated effort will allow him to be involved in the seminars and workshops, and to guide the research activities in situ. Electronic communications will be used at other times; all sites have advanced telecommunications facilities.

Site PIs Furuta and Giles will run the research activities at their respective sites. In addition, each will make one trip per year to Qatar, affording a full week of concentrated effort to connect with the people and work in Qatar.

Table 2 summarizes the staffing, with additional details shown in the Budget and under Timeline and Activities.

Table 2. Summary of Project Staffing

Institution	Staffing
Qatar University	Co-LPI Samaka, PI Impagliazzo, Consultant-1 (Thompson), Consultant-2 (Lukesh), Research Assistant-5
Virginia Tech	LPI Fox, Graduate Student-1 (= Research Assistant-1 in Qatar)
Penn State University	PI Giles, Graduate Student-3 (= Research Assistant-3 in Qatar), Graduate Student-4 (1/4 time), Research Assistant-5 (undergrad student, on wages)
Texas A&M University	PI Furuta, Graduate Student-2 (= Research Assistant-2 in Qatar)

Appendix 4 gives support letters from those in Qatar who are endorsing this project. They will constitute the core of an Advisory Council that will guide the project to meet its goals. They will meet twice each year, receive reports from the Evaluator, and will coordinate with the project Executive Committee (Drs. Fox and Impagliazzo) to ensure that the project succeeds.

5. Anticipated results and evaluation criteria.

The project team will collect data from the community stakeholders in Qatar to include scholars, educators, students, and the public at large. The data will be collected in both quantitative and qualitative form. Part of the quantitative data will include surveys on demographic information from a variety of sources at the beginning and at the end of each phase of the project as prescribed by the specialized evaluator. Other quantitative data will include pre- and post-tests of content knowledge and post project questionnaires; qualitative data will consists of focus groups, library portfolios, and performance achievement at seminars and workshops, and at other events where evaluations are appropriate. The qualitative data will be evaluated on the following dimensions: marketability, originality, unconventionality, utility, feasibility, effectiveness, and quality (recall Figure 4). Some evaluation tools to consider for quantitative data include the Test for Creative Thinking-Drawing Production (TCT-DP), Wonderlic Personnel Test, and Transactive Memory Scale [183,184,185].

5.1 Project Evaluator

It is important to have an experienced/professional person to evaluate this project should it receive funding. Susan Lukesh has considerable library and evaluative experience and is independent of the project so she can be as objective as possible. She will conduct evaluation activities such as using surveys, conducting interviews, making observations, organizing focus groups, doing comparative studies, collecting quantitative and qualitative data, and writing reports.

5.2 Evaluation Process

The evaluation will include both formative (progressive) and summative (outcome) assessment components. The evaluator will use a combination of quantitative (surveys, test results, web usage, collection metrics, enrollment data, etc.) and qualitative (observations, interviews, focus groups) methods, with assessment data collected from constituent participants and industrial mentors. The objective is to provide a means for continuous improvement of the project and to demonstrate the feasibility of the program as a model for other institutions that wish to integrate entrepreneurship and industry sponsored projects into the computing curriculum. In addition to formative and summative outcomes assessment for each activity in both the control and training conditions, the evaluator will perform ongoing qualitative assessment of the organizational functions of the project management team. The evaluator will perform assessments of the constituents to examine whether the experience enhances performance in the constituents.

The following is an outline of the basic elements of an assessment plan and some of the specific modalities (e.g., surveys and interviews) used during the first year of the project implementation. The formative evaluation will provide information that the key investigators can use for project improvements during its implementation. The summative evaluation focuses upon the project outcomes and the overall success of the project. Throughout, the project will not violate any statute or procedure involving human subjects. The project team will replace all identification information with a code before it provides data to the external evaluator for analysis.

5.2.1 Formative Evaluation

At the end of each project year, the plan is to assess the progress of the project according to the objectives stated earlier in this proposal. The key investigators will use such formative assessment in a continuous process to identify how successfully the project is in achieving its intended objectives. They also will use the formative assessment to make decisions regarding program changes that will enhance the achievement of the planned project objectives. The key investigators will use the assessment to evaluate the organization of the management team and to suggest changes for project improvements.

Part of the formative evaluation will be to measure the effectiveness of integrating digital library understanding, communication skills, and project-oriented content throughout the length of the project. The evaluator will administer such queries at the beginning of an activity as a pretest and at the end of the activity as a posttest. The key investigators base the validation of these queries on the assumption that the participating instructors are experts within their field. The external evaluator and the project team will provide further validation and review. Using a common scoring rubric, seminar

and workshop instructors will score responses to such queries and the project team will make comparisons across different years of offerings to improve continuously the course offerings.

5.2.2 Summative Evaluation

The use of summative data collection will begin in the second year of the project and continue until the final year. Analysis of this data will be ongoing throughout this period. The key investigators will use the summative evaluation to assess the extent to which the project met its goals, the effectiveness of the project activities, and the impact the program had on the stakeholders. In addition, a report generated from summative assessment will recommend changes in content and/or implementation to enhance the success of an institutionalized version of this project or that of similar projects that may be under development in the future The report will include recommendations for replicating this program in other settings, addressing differences in institutional structure and resources that may affect such replications and suggesting optimal methods to work within existing constraints.

6. Strategy for project continuation

To revitalize community education in a significant way, the ultimate goal of the project is to produce national and self-sustainable models in Qatar and the region that are transferrable to a variety of institutional settings. The project team addresses the sustainability aspect of the project in a somewhat novel manner. The project team envisions the constituents of the project to join a digital library activity to "close the loop" in an active and direct way by supporting and mentoring others and to make suggestions to improve and disseminate the attributes of the project. The team expects the disciples of the project to assist in the continuous improvement of the project, present seminars, and sponsor a prototype development fund for the project.

The success of the project provides a stimulus for ongoing efforts to make the outcomes of the project permanent throughout Qatar, the Gulf region, the Middle East, and beyond. While we can make no promise at this time, there should be many useful research projects that will emanate from this important endeavor. Ultimately, the Qatar University Library and the Qatar Foundation Central Library will inherit the fruits of the activities. The results of the project are necessary for the long-term research and preservation interests of Qatar and its people.

7. Plans for disseminating research results

7.1 Seminars

Presentation style explanations, with a small amount of hands-on activity, will take place each year through a 2.5 day DL seminar. Requirements for the community, requested topics, and availability of DL curricular modules will factor into planning for these. Thus, what is shown in Section 4.6 may be modified and refined as requirements are better understood.

7.2 Workshops

Hands-on workshops, involving team work, will allow Qatari digital librarians to develop mastery with regard to: digitization, crawling, indexing, and advanced searching. These will make use of software and systems developed and installed in Qatar. These will occur yearly, requiring at least 3.5 days.

7.3 Consulting Center

As digital librarians work through seminars and workshops, and self-study DL curricular modules, questions may arise. In addition, practicing digital librarians may run into challenging problems as they develop supplementary collections. The project team will run a consulting center as part of the institute. Not only will they help, but they will learn more about the needs and constraints in Qatar, helping guide activities in other parts of the project. These efforts will expand into mentoring networks, as project personnel and digital librarians in Qatar develop appropriate social networks.

Further, Qataris who have achieved even moderate proficiency as digital librarians can help as peer consultants. Hopefully the DL community in Qatar initially will follow an exponential growth as a result.

7.4 Online

Project results will appear online on project websites (starting from the project site, also including the Qatar University web, and linking to the three US institutions as well). Curricular modules will be added to the DL curricular site in Wikiversity too.

The project server will run the Drupal content management system [53], and the Fedora Repository system [54]. Hence it will be easy to host group discussions moderated by project staff, including on the following:

- Chemistry
- Computing
- Consulting Q&A
- DL curriculum development
- Educational resources
- Electronic theses and dissertations
- Museum information
- Seminars
- Workshops

7.5 International Conferences

The project PIs have been among the most prolific in publishing at DL conferences. We will report results at the key DL conferences each year, typically held in North American, Europe, and Asia, respectively JCDL, TPDL, and ICADL. We also may present in related conferences like WWW, SIGIR, and CIKM – as well as related journals like IJDL and TOIS.[2]

[2] ACM/IEEE-CS Joint Conference on Digital Libraries, Theory and Practice of Digital Libraries, International Conference on Asian Digital Libraries, International World Wide Web Conference, Annual ACM SIGIR (Special Interest Group on Information Retrieval) Conference, ACM Conference on Information and Knowledge Management, International Journal on Digital Libraries, ACM Transactions on Information Systems

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Potential Applications

In case of applied research, indicate the potential applications of the research results.

View potential applications

Potential applications of the research results:

Information is essential for government as well as education and all activities related to scholarship. Digital libraries (DLs) are advanced information systems supporting all types, aspects, services, and uses of information for interested communities. Planned research will make it easier to collect, analyze, index, discover, use, preserve, and build on key Qatari information. There will be separate collections for key communities, tailored to be applied to their needs, initially those interested in: 1) government information; 2) education; 3) computing; 4) chemistry. Users will be able to apply the collections of information to improve government services, enhance teaching and learning, and advance scholarship. They will use the advanced DL services to find relevant information more efficiently and effectively. This will go well beyond current search engines and search services, allowing use of the citations between papers, opening up the data in tables, and making it much easier to reuse educational resources. A cadre of Qatari digital libraries will emerge to build additional collections and services covering all aspects of Qatari society, including other sciences and technologies, the arts, cultural heritage, humanities, and the professions.

Edit

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Proposal NO.
NPRP 4 - 029 - 1 - 007

Publication(s)

The Lead PI has to upload a minimum of three and a maximum of 5 published papers or manuscripts accepted for publication **by him/her or any of the participating Key investigators** that are relevant to the proposed research project.

Publications help video

* Required fields

View publication(s)

Title of Publication: Assessing User-Centric Quality of Web-Based Systems
Publication File: Khaled_Samaka_Eeno_Budhiraja_Final_paper_Vol3_No1_2.pdf
Delete

Title of Publication: The Computing Ontology - Application in Education
Publication File: Impagliazzo-Ontology-p171-.pdf
Delete

Title of Publication: What Humanists Want: How Scholars Use Source Materials
Publication File: audenaert-jcdl2010.pdf
Delete

Title of Publication: Enhancing Digital Libraries with Social Navigation: The Case of Ensemble
Publication File: brusilovsky-ecdl2010.pdf
Delete

Title of Publication: SeerSuite: Developing a scalable and reliable application framework for building digital libraries by crawling the web
Publication File: usenix2010-seersuite.pdf
Delete

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Proposal NO.
NPRP 4 - 029 - 1 - 007

Research Support

Indicate any ongoing and previous research funds received over the past three years by each of the key investigators.

Research Support help video

* Required fields

Do you have ongoing and previous research funds received over the past three years by any of the key investigators? (•) No ( ) Yes

View research support

Name of Key investigator: Dr. Edward Fox
Title of the proposal: From Desktops to Clouds - A Middleware for Next Generation Network Science
Performance Period: 8/1/2010- 7/31/13
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $1,350,000.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Social Media for Cities, Counties, and Communities
Performance Period: 7/1/2010- 12/31/2010
Name of Funding Agency: CCSR
Funded amount: $15,000.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Biometrics Training and Performance Initiative (BTPI)
Performance Period: 5/1/09-10/31/10
Name of Funding Agency: BAE Systems (with funds from DHS)
Funded amount: $484,622.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Department Climate Mini-Grant Program for Computer Science Mentoring
Performance Period: 11/16/2009-6/30/2010
Name of Funding Agency: VT Advance
Funded amount: $2,500.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Establishing the Quantitative Basis for Sufficiency: Thresholds and Metrics for Friction Ridge Pattern Detail Quality and the Foundation for a Standard
Performance Period: 11/10/2009-11/9/2011
Name of Funding Agency: National Institute of Justice

Funded amount: $854,907.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Integrated Digital Library Support for Crisis, Tragedy, and Recovery
Performance Period: 8/1/2009 - 7/31/2012
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $500,000.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Curatorial Work and Learning in Virtual Environments,
Performance Period: 4/1/09-3/31/10
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $75,000.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Living In the KnowlEdge Society
Performance Period: 11/14/2008- 11/12/2009
Name of Funding Agency: VT Center for Excellence in Undergraduate Training (CEUT)
Funded amount: $2,100.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Ensemble: Enriching Communities and Collections to Support Education in Computing
Performance Period: 9/15/2008 - 8/31/2011
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $2,000,000.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Extraction of Named Entities from Documents for Business Purposes
Performance Period: 2/2008 - 6/2008
Name of Funding Agency: IBM
Funded amount: $25,450.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Concept Maps for Discovering /Using Multilingual Electronic Theses and Dissertations
Performance Period: Sept. 2007
Name of Funding Agency: Google
Funded amount: $50,000.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: A Digital Library Testbed for Research Related to 4/16/2007 at Virginia Tech
Performance Period: August 15, 2007 - July 31, 2008
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $199,993.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Living In the KnowlEdge Society (LIKES)
Performance Period: August 1, 2007 - July 31, 2010
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $289,999.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Deployment and Assessment of an Image Annotation and Retrieval Tool, Including for Biodiversity
Performance Period: 5/16/2007 - 5/15/2008
Name of Funding Agency: Microsoft Research
Funded amount: $50,000.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Storytelling in the National Nuclear Archive
Performance Period: 4/1/2007-3/31/2008
Name of Funding Agency: Idaho National Laboratory
Funded amount: $100,000.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: A National Engineering Dissection Cyber-Collaboratory
Performance Period: 1/1/2007 - 12/31/2008
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $104,378.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Curriculum Development: Digital Libraries
Performance Period: 1/1/2006 - 12/31/2009
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $272,187.00

Edit Delete

Name of Key investigator: Dr. Edward Fox
Title of the proposal: Personalization of Content: Bridging the gap between NSDL and its users through the course website
Performance Period: 9/1/2005 - 8/31/2008
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $449,912.00

Edit Delete

Name of Key investigator: Prof. C Lee Giles
Title of the proposal: Cyberinfrastructure and Research Facilities: Developing Collaboratory Tools to Facilitate Multi-Disciplinary, Multi-Scale Research in Environmental Molecular Sciences
Performance Period: 9/15/2005-9/14/2011
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $2,293,125.00

Edit Delete

Name of Key investigator: Prof. C Lee Giles
Title of the proposal: Next Generation CiteSeer

Performance Period: 8/1/2005-7/31/11
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $1,200,000.00

Edit Delete

Name of Key investigator: Prof. C Lee Giles
Title of the proposal: Semantic CiteSeerX
Performance Period: August 2010 - August 2014
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $1,000,000.00

Edit Delete

Name of Key investigator: Prof. C Lee Giles
Title of the proposal: Creating a Book Citation Index
Performance Period: 2010 - 2012
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $150,000.00

Edit Delete

Name of Key investigator: Prof. Richard Furuta
Title of the proposal: Mediation of Research Group Scholarly Activity in a Digital Library: Steps Towards the Nautical Archaeology Digital Library
Performance Period: 1/1/06-12/31/10
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $404,180.00

Edit Delete

Name of Key investigator: Prof. Richard Furuta
Title of the proposal: Creating an Archive of Don Quixote Illustrations
Performance Period: 9/1/06-8/31/08
Name of Funding Agency: National Endowment for the Humanities
Funded amount: $325,000.00

Edit Delete

Name of Key investigator: Prof. Richard Furuta
Title of the proposal: Ensemble: Enriching Communities and Collections to Support Education in Computing
Performance Period: 10/1/08-9/30/11
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $425,000.00

Edit Delete

Name of Key investigator: Prof. Richard Furuta
Title of the proposal: Engineering Transfer Scholars (ETS) in Texas
Performance Period: 3/1/09-2/28/13
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $597,498.00

Edit Delete

Name of Key investigator: Prof. Richard Furuta
Title of the proposal: Supporting Creativity in the Analysis and Understanding of Visually Complex Documents
Performance Period: 8/1/10-7/31/13
Name of Funding Agency: NSF
Funded amount: $200,000.00

Edit Delete

Name of Key investigator: Prof. Richard Furuta
Title of the proposal: NSDL Service to Manage Distributed Collections
Performance Period: 9/15/10-8/31/13
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $510,000.00

Edit Delete

Name of Key investigator: Prof. John Impagliazzo
Title of the proposal: Excellence in Computer Education with Entrepreneurship and Leadership Skills (EXCE2L)
Performance Period: 2008-2011
Name of Funding Agency: National Science Foundation (NSF)
Funded amount: $289,906.00

Edit Delete

Name of Key investigator: Dr. Mohammed Samaka
Title of the proposal: e-PBL: An E-Learning Environment Supporting the Problem-Based Learning
Performance Period: Feb. 2009 - Oct. 2011
Name of Funding Agency: Qatar University
Funded amount: $64,807.00

Edit Delete

Name of Key investigator: Dr. Mohammed Samaka
Title of the proposal: A platform for Rich Mobile Services
Performance Period: Sept. 2008 - June 2009
Name of Funding Agency: Qatar Research National Fund (QNRF)
Funded amount: $40,000.00

Edit Delete

Name of Key investigator: Dr. Mohammed Samaka
Title of the proposal: QTEL-Cell Broadcast (QTEL–CBC)
Performance Period: Sept. 2007 - June 2008
Name of Funding Agency: Qatar Research National Fund (QNRF)
Funded amount: $30,000.00

Edit Delete

Name of Key investigator: Dr. Mohammed Samaka
Title of the proposal: A mobile service using bar-code for check-in to venue/facility
Performance Period: Sept. 2006 - June 2007
Name of Funding Agency: Qatar Research National Fund (QNRF)
Funded amount: $24,000.00

Edit Delete

Name of Key investigator: Dr. Mohammed Samaka
Title of the proposal: Developing A PBL-Based E- Learning Application
Performance Period: Sept. 2007 - June 2008
Name of Funding Agency: Qatar University
Funded amount: $16,758.00

Edit Delete

Name of Key investigator: Dr. Mohammed Samaka

Title of the proposal:	Developing A Mobile Service Using Bar-Code For Check-In To Venue/Facility
Performance Period:	Sept. 2006 - June 2007
Name of Funding Agency:	Qatar University
Funded amount:	$2,747.00

Edit Delete

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Proposal NO.
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Miscellaneous Document(s)

If applicable, use this location to upload recommendation letters from stakeholders and non-collaborative individuals, questionnaires, etc

Miscellaneous Documents help video

* Required fields

Do you want to upload miscellaneous document(s) related to this proposal?* (•) No ( ) Yes

View miscellaneous document(s)

Title of Document: Appendix 2
Document File: Appendix2.pdf
Delete

Title of Document: Appendix 3
Document File: Appendix3.pdf
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Title of Document: Appendix 4
Document File: Appendix4.pdf
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Title of Document: Appendix 1
Document File: Appendix1.pdf
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Appendix 1

Other Investigators for proposal number: NPRP 4 - 029 - 1 – 007, NPRP 4th cycle

“Establishing a Qatari Arabic-English Digital Library Institute”

Consultant 1: Librarian expert, Carole Thompson
Consultant 2: External evaluator, Susan Lukesh

Consultant 1: Librarian Expert

Carole Thompson, MLIS, MBA is an experienced information manager in libraries and information technology departments, having worked in and directed operation groups for over 28 years in public and private universities in California and Qatar. Her background is in systems hardware and software, as well as managing specialized applications for web and automated information dissemination. Additional duties have given her expertise in building digital libraries and collections, and configuring and adding metadata in a variety of standardized structures such as MARC, VRA and Dublin Core.

She has worked in a variety of subject areas, including liberal arts, humanities, the sciences and technology. As a member of library system groups completing various data preservation projects, she has historical understanding and contemporary skills at converting analog data to digital formats as well as working with born-digital content. Working for the past seven years during the establishment of the universities at Education City has grounded her with a solid understanding of the information discovery needs of students, scholars and citizens in Qatar as well as a network of contacts in libraries and museums who are now creating the infrastructure that will provide access to resources.

Consultant 2: External Evaluator

Susan S. Lukesh, PhD, MLS is an experienced higher education administrator with well over twenty years experience in developing, managing and reorganizing schools, departments and organizations. These organizations and reorganizations include (but are not limited to) the following efforts: the collection, analysis and use of data to improve performance; the establishment of outcome measurements and definition of regular assessments; and the design of data structures; in short, activities that move organizations into a data driven, outcome oriented process.

She has long experience in research, scholarship, and crafting proposals and budgets as well as supporting a number of grants, specifically in the drafting and editing. As Associate Provost she routinely created models to assess the financial impact of changes in faculty contracts as well as to support new initiatives. She completed an MLS degree a decade ago, a program she undertook because of her interest in modern scholarly communication and the effect of digital technology on research and publication, topics she has written on and whose published outcome is easily available online. Subsequently she served for three years on the Institute of Museum Library Services (IMLS) panel reviewing grant applications for funding in museum and library science. Recently she undertook a week-long an American Grant Writers Association (AGWA) workshop in grant writing, culminating in a day-long exam. Successfully passing the exam that covered writing, funder criteria and budgets she is an AGWA certified grant writer.

Appendix 2

Quotes for Main Server for proposal number: NPRP 4 - 029 - 1 – 007, NPRP 4th cycle
“Establishing a Qatari Arabic-English Digital Library Institute”

See the next pages for copies of the quotes on each of:

a) Dell PowerEdge R610	$25,236
b) Dell PowerConnect 6224	$ 3,842
c) Silicon Mechanics Storform iS703	$ 5,661

Regarding budgeting, please note:

Net:	$34,739
S&H and customs:	$7,261 (approx 20%)
Total cost:	$42,000 (Distributed over three years at $14,000 per year)

View/Print Cart

Print Page

Description

PowerEdge R610

Date & Time: November 30, 2010 1:43 PM CST

SYSTEM COMPONENTS

PowerEdge R610	Qty	3
Chassis for Up to Six 2.5-Inch Hard Drives, No Operating System	Unit Price	$9,305.00
Save $893 on select PowerEdge R310 storage through Dell Small Business! Special offer		- $2,679.00

Finance at Prime Rate of 3.25% on SELECT PowerEdge rack or tower configurations of $1500 or more.
Promotional rate valid for life of today's purchase balance.

Catalog Number: **4 BEDWCRD**

Module	Description	Show Details
PowerEdge R610	Chassis for Up to Six 2.5-Inch Hard Drives	
Operating System	No Operating System	
Shipping	PowerEdge R610 Shipping	
Memory	48GB Memory (6x8GB), 1333MHz Dual Ranked RDIMMs for 2 Processors, Optimized	
Feature Upgrades for Embedded NIC Ports	Dual Two-Port Embedded Broadcom® NetXtreme II 5709 Gigabit Ethernet NIC	
Primary Processor	Intel® Xeon® X5650, 2.66Ghz, 12M Cache,Turbo, HT, 1333MHz Max Mem	
Additional Processor	Intel® Xeon® X5650, 2.66Ghz, 12M Cache,Turbo, HT, 1333MHz Max Mem	
1st Hard Drive	HD Multi-Select	
Internal Controller	PERC 6/i SAS RAID Controller, 2x4 Connectors, Internal, PCIe, 256MB Cache	
BIOS Setting	Power Saving BIOS Setting	
Embedded Management	iDRAC6 Express	
Internal Optical Drive	DVD ROM, SATA, Internal	
Bezel	Bezel	
System Documentation	Electronic System Doc, OpenManage DVD Kit with Dell Management Console	

Hard Drive Configuration	RAID 5 for H700 or PERC 6/i Controllers
Rails	No Rack Rails or Cable Management Arm
Hardware Support Services	3Yr Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite
Installation Services	No Installation
Proactive Maintenance	Maintenance Declined
Power Supply	High Output Power Supply, Redundant, 717W
Power Cords	No Additional Power Cord
Power Cords	NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord
Hard Drives	(6) 500GB 7.2K RPM Near-Line SAS 6Gbps 2.5in HotPlug Hard Drive

TOTAL: $25,236.00

Additional Discounts and Coupons

Free 3-5 day Ground Delivery Shipping on Select Dell Systems!
Special Offer

	Total Price
Sub-total	$25,236.00
Shipping & Handling[1]	--
Tax	--
Total Price[2]	--

snCM07

View/Print Cart

Print Page

Description

PowerConnect 6224

Date & Time: November 30, 2010 3:46 PM CST

SYSTEM COMPONENTS

PowerConnect 6224	Qty	2
PowerConnect 6224, 24 GbE Ports, Managed Switch, 10GbE and Stacking Capable	Unit Price	$1,897.00

Catalog Number: **18 MLB1847**

Module	Description	Show Details
PowerConnect 6224	PowerConnect 6224, 24 GbE Ports, Managed Switch, 10GbE and Stacking Capable	
Hardware Support Services	3Yr Basic Hardware Warranty Repair: 5x10 HW-Only, 5x10 NBD Onsite	
Installation Services	No Installation Services Selected	

TOTAL: $3,794.00

	Total Price
Sub-total	**$3,794.00**
Shipping & Handling[1]	--
Tax	--
Total Price[2]	**--**

Price: **$3,842.00**
Payment: **$103**
Number of Months: **48**
Total Payments: **$4,944.00**

Silicon Mechanics
22029 23rd Dr SE
Bothell, WA 98021-4410
(425) 424-0000

Quote

Date	Quote #	Confirmation #
11 / 30 / 2010	194210	979450972

Bill To:	Ship To:
pbt105@psu.edu	Pradeep pbt105@psu.edu

Description	Quote_Nov_30th
Notes	

Quantity	Description	Price Each	Amount
1	**Storform iS703** Storage Management: Open-E DSS (Data Storage Server) - 12TB License Drive Set: 8 x 1TB Seagate Constellation ES (3Gb/s, 7.2K RPM, 32MB Cache) 3.5" SATA Ext. SAS/SATA Connector: External SAS / SATA Connector for JBOD Expansion (SFF-8088) - Integrated RAID Controller: Integrated 3Ware SAS/SATA Hardware RAID Controller RAID Configuration: RAID 6: Striping with Double Parity Connectivity: Dual-Port Intel 82563EB Gigabit Ethernet Controller - Integrated I/O Expansion - 1: No Item Selected Power Supply: Redundant 800W (1 + 1) Power Supply with PFC - 89% Maximum Efficiency Warranty: Std 3-Yr Warranty + 1-Yr Expanded Warranty, 24x7 Helpdesk, 4-Hr Same-Day On Site - Spare Parts Req **Configured Power:** 376 W, 386 VA, 1285 BTU/h, 3.5 Amps (110V), 1.9 Amps (208V)	5661.00	5661.00

Subtotal	5661.00
Sales Tax (0%)	0.00
Total	USD 5,661.00

Orders from WA are subject to the appropriate tax rate. The quoted tax amount is subject to change.

Appendix 3

Multimedia Equipment

Year	Equipment or software	Description	Price each (QR)
1	Flash unit	Canon Speedlite 580EX II	2500
1	Dragon dictation software	Nuance Software	900
1	Adobe	Photoshop Elements (US Educational Pricing)	320
1	Adobe	Acrobat X Pro (US Educational Pricing)	900
		SUBTOTAL:	**4620**
		10% Shipping and Handling:	462
		Year 1 TOTAL:	**5082**
Year	Equipment or software	Description	Price each (QR)
2	Camera body	Canon EOS Rebel T1i 18-55MM IS Kit (standard Zoom 15MP)	3650
2	Tripod		200
2	Lens - Telephoto zoom	Canon EF 70-300mm f/4-5.6 IS USM	3000
2	GPS	Garmin Oregon 550t	750
	Battery backup for camera body	Canon	395
		SUBTOTAL:	**7995**
		10% Shipping and Handling:	800
		Year 2 TOTAL:	**8795**
Year	Equipment or software	Description	Price each (QR)
3	Additional SD memory	32GB	980
3	Camcorder	Canon Legria HF S21	5460
3	Battery pack for Camcorder	Canon	400
		SUBTOTAL:	**6840**
		10% Shipping and Handling:	684
		Year 3 TOTAL:	**7524**

Appendix 4

Support letters for proposal number: NPRP 4 - 029 - 1 – 007, NPRP 4th cycle
“Establishing a Qatari Arabic-English Digital Library Institute”

See the next pages for three support letters:

1) Joan de Beer, Interim Director, Qatar Foundation Central Library

2) Bruce R. Palmer, Professor of Chemical Engineering and Interim Associate Dean of Research and Graduate Studies, Texas A&M University at Qatar

3) Bijan Esfahani, Library Director, Carnegie Mellon University Qatar

Ref: QF/CL/GEN/04/2010

December 12, 2010

Carole Thompson
Director
The Library
Texas A&M University at Qatar
PO Box 23874
Doha, Qatar

Dear Ms. Thompson,

Sub: Qatar National Research Project: NPRP 4 - 029 - 1 – 007

As discussed, the Qatar Foundation Central Library (QFCL) would be interested, in principle, to support your project proposal and to consider inhe

eritance of the digital library on its completion.

from Qatar University, Pennsylvania State University, Virginia
et up a Qatari Arabic-English Digital Library Institute that will
uments, research documents and samplings of collections on
uation for the project after three years through the inheritance
e potential transfer might occur, if the project is not extended
ater.

The proposal, from computer scientists f
Tech University and Texas A&M, is to se
include collections of e-government docu
the cultural side, with the possible continu
by QFCL of the ensuing digital library. The
with additional NPRP funding, in 2015 or l

ne Qatar national goal to build a knowledge society, the QFCL
inue appropriate support for the digital library infrastructure,
e of all projects and outcomes, equipment and collections is
any requirements and the existence of no conflict with Qatar

In line with its own mission to support th
would accept, in principle, a role to cont
beyond the grant funding. Acceptance
subject to the QFCL being able to meet a
Foundation or QFCL policies.

Best Regards,

Joan de Beer
Interim Director
Qatar Foundation Central Library

جامعة تكساس إي أند أم في قطر
TEXAS A&M UNIVERSITY at QATAR

RESEARCH AND GRADUATE STUDIES

8 December 2010

Dr. Abdul Sattar Al-Taie
Director, Qatar National Research Fund
Qatar Foundation
P.O. Box 5825
Doha Qatar

Subject: Proposal Endorsement
Project Title: Establishing a Qatari Arabic-English Digital Library Institute
NPRP Number: 4 – 029 – 1 – 007

Dear Dr. Al-Taie:

The project proposal titled "Establishing a Qatari Arabic-English Digital Library Institute" represents an important contribution to the development of information dissemination in Qatar. The country can increase its potential as a regional leader by contributing to the intellectual, cultural and historical development of Qatar through this project.

The development of library and information services in Qatar has just begun. Because of this, there is a unique opportunity to take advantage of new technologies that will capture, archive and create accessibility to information resources. These innovative will offer solutions to library challenges, and serve as a model that produces a new culture in acquiring information. The project aims to instill a new excitement in information gathering through an infusion of computing algorithms and searching techniques.

At Texas A&M University at Qatar, this project would advance our organization as one of the leaders in the changing field of information resource management at a unique point in Qatar's development toward becoming a knowledge society. The project has definite merit; our organization and Qatar would definitely benefit from its funding. I fully endorse the concept of this proposal and recommend its funding.

Sincerely,

Bruce R. Palmer

Bruce R. Palmer, Ph.D.
Interim Associate Dean of Research and Graduate Studies,
Professor, Chemical Engineering

cc: Carole Thompson, Library Director

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Qatar Foundation
P.O. Box 5825
Doha Qatar

Subject: Proposal Endorsement
Project Title: Establishing a Qatari Arabic-English Digital Library Institute
NPRP Number: 4 – 029 – 1 – 007

Dear Dr. Al-Taie:

The project proposal titled "Establishing a Qatari Arabic-English Digital Library Institute" represents a wonderful step forward in Qatar's information infrastructure. This type of information service is becoming increasingly common as a way for technologically advanced libraries, universities, museums and other institutions to both archive and provide open access to critical information resources and artifacts. This type of development is an essential part of a knowledge society, and would hasten Qatar's development in this regard.

As a library director, I see this project as a welcome advance in Qatar and our organization. The project has great merit. I fully endorse the concept of this proposal and recommend its funding.

Sincerely,

Bijan Esfahani

Bijan Esfahani,
Director

مؤسسة قطر
Qatar Foundation