
BUILDING A NEW GENERATION SCIENCE LIBRARY: THE KAUST STORY

Rashed Al Zahrani, Joseph Branin, Yi Yu

King Abdullah University of Science and Technology

Thuwal, Saudi Arabia

Rashed.ALZahrani@KAUST.EDU.SA

Joseph.Branin@KAUST.EDU.SA

Yi.Yu@KAUST.EDU.SA

Abstract

If you had the opportunity to build a science library from scratch for a new generation of researchers and students, what would it look like and how would it operate?

We will show you the vision and reality of the new King Abdullah University of Science and Technology (KAUST) Library that won the 2011 ALA/AIA Library Architecture award and that for the last three years has been providing a high level of information services to top level international scientists and graduate students.

We will describe the major characteristics in contemporary science research, education, and information management that guided the design of our library facility, technical infrastructure, and services. We will give concrete examples and evaluations of our implementation of new information services and tools. And we will end with the challenges still before us, most notably the effective integration of science knowledge management into the workflow of scientific research and enterprise based information technology organization.

Introduction

In September of 2009, astonishingly on schedule, a new science university opened in Saudi Arabia. Named after the nation's leader, whose vision and support made King Abdullah University of Science and Technology a reality, "KAUST," as the university is called, removed its scaffolding and cranes to reveal an ultra-modern campus and living community on the shore of the Red Sea, next to the ancient fishing village of Thuwal, an hour's drive north of the thriving metropolis and international port of Jeddah.

It was astonishingly on schedule, because of the massive commitment of resources, expertise, and labor needed to plan, build, and open an academic campus and living community in a mere thirty-two months: nine months for design and documentation, and 23 months for mockups and construction [HOK, 2008]. Contrast this to a typical major, higher education, capital project in the United States. At Ohio State University, where the library came from to join KAUST, the university was just finishing a major transformation of the central library there, and that project took a total of nine years of planning, fund raising, design, and construction [Branin, 2007],[Boomgaarden et al., 2010]. To build a whole campus and small city, not just one academic building, in a mere thirty-two months was an astonishing feat.

Not only was the unified, modern architecture of this new University stunning and innovative – the project was awarded Platinum LEED certification -- but many of the policies and organizing principles were bold and controversial for Saudi Arabia and for traditional practices in Western universities. There would be no tenure for faculty, and no typical academic departments. Services and facilities, such information technology and human resources support, core labs, and classrooms, would be highly centralized, rationally organized, and enterprise wide in perspective. Admissions, promotion, salary increases were to be based on merit. The best graduate students, faculty, and staff, male and female, would be drawn from around the world to work together in a safe and secure, open, and well-supported scientific research setting.

Vision to Reality

In September 2009, KAUST opened for business, admitting its first class of 800 graduate students (25% female) taught by 100 faculty who were organized into three broad science and engineering divisions: Math and Computer Science, Physical Sciences, and Chemical and Life Sciences. It was and remains a truly international body of students, faculty, and staff. In December 2010, its second year of operation, for example, a demographic snapshot of the student body showed 36% coming from Saudi Arabia and the Middle East, 34% from Asia, 21% from the Americas, 5% from Europe, and 4% from Africa [KAUST, 2011a].

KAUST is more than a traditional academic campus. It is also a small city with houses, apartments, public schools, shopping and dining, recreational facilities, security and fire services, medical clinic, and public transportation. In 2009 the entire population at KAUST was approximately 4,000 people, which grew to 6,000 people by 2012. In addition to the campus and community, KAUST has made significant resources available for global collaborative research with some of the top science universities in the world, including Cornell, Oxford, Stanford, and Texas A&M University [KAUST, 2011b]. Economic development, technology transfer, and industrial partnerships programs are a high priority at KAUST, as the University is committed to diversifying and advancing the economy of Saudi Arabia and the Middle East region.

KAUST President, Choon Fong Shih, who was formerly President of the National University of Singapore, often reminds his university of King Abdullah's "noble vision" for this new "House of Wisdom" that will

1. *Reconnect with the enormous role played by Islamic civilization during its golden age in serving humanity;*
2. *Advance and harness science and technology to benefit Saudi Arabia and the world; and*
3. *Grow a scientific community that embraces diverse peoples from around the world. [KAUST, 2011c]*

Designing a New Generation Science Library Building

KAUST presented a special opportunity to design a new generation science library facility from scratch, without the impediments or legacy drags of the past. A key requirement, however, was to do it fast, which meant few or no design "change orders" during construction. KAUST used a team of architects, consultants, and library staff to design the building in 2008, and pretty much stuck to this design through the two-year construction process. Drawing on best practice in designing new libraries, specifically science libraries, the design would emphasize open, flexible, and transparent space; a variety of study spaces, from quiet, individual work space to collaborative group areas; good social amenities; a robust IT infrastructure; a small footprint for print collections; and self-services for a 24/7 building.

All these design features were achieved and actualized in beautiful architecture. The building is situated in the most central and attractive site on campus, and has received uniform praise from students, faculty, and visitors as a truly beautiful and functional library building. In 2011, KAUST (and its global architectural firm of HOK with headquarters in St. Louis, USA) [HOK, 2012] was selected for the American Library Association/Institute of American Architects award as one of the best new library buildings of the last two years. The award citation describes the building in these poetic terms:

Situated as the focal point of the new campus, the library crystallizes the architectural ambitions of this university as a contemporary global center for scientific thinking that is rooted in local culture and place. The planning of the library challenges normative library science by de-emphasizing the library as a repository of books while emphasizing the social dimensions of learning and the access to knowledge through technology. While it is constructed in modern building language, this library makes poetic allusions to Arabic architecture recalling the traditional House of Knowledge.

The House of Knowledge as was a place of gathering and learning, and at this university the library serves this function, providing informal settings for scientists to share thoughts and ideas. Group study areas and informal lounges are located throughout the library, and a café is integrated at the entry, blurring the boundary of formal and informal knowledge sharing.

Essentially, the library is a simple platonic volume that has been covered with a light-filtering, translucent, stone shroud. The shroud and form are manipulated to facilitate the library's program and give it character. The shroud drapes the north and south façades while leaving the east and west facades open. This provides grand views of the Red Sea to the west and transparency toward the campus to the east. Purposeful incisions in the shroud connect it with its surroundings.

The library engages light to create a marvelous and palpable sense of temporality that enriches its character and makes it an iconic part of its campus. During the day, the translucent stone of the shroud appears to be solid from the exterior but luminous on the interior. This gives the library a robust sense of permanence. But in the evening, as the differential light levels between indoors and outdoors

flips, the shroud becomes translucent and begins to glow. Through this transformation, the interior is put on display, and library becomes a luminous beacon - representing the campus as a paradigmatic center for thinking, science and learning [AIA, 2011].

Developing Staffing, Collections, and Services

Having a beautiful and functional science library facility is a very important asset, but, of course, it must be staffed with talented librarians who can build relevant collections and information services in support of graduate education and advanced scientific research. We think the optimum number of staff we need to meet the scope of our responsibilities is approximately thirty, and this summer (the summer of 2012) we expect to have twenty-eight slots filled. Our support staff positions, numbering fifteen, are filled through local searches and generally draw from western Saudi Arabia and the campus community. The professional staff, numbering thirteen, are filled through international searches and have resulted in an international mixture of professional staff from Saudi Arabia, the United States, Canada, India, Singapore, Finland, and Botswana [KAUST, 2012]. The staff are organized into three divisions: Administrative, Technical, and Research Services, with a manager for each division who reports to the Library Director. All staff are expected to be fluent in English, the language for teaching and research at KAUST. We recruit staff who have excellent basic work skills and habits and, as much as possible, bring an expertise in science librarianship. Staff are offered many opportunities for continuous learning drawing on the more experienced library staff for on-the-job training, campus HR training basic skills and management training, and regional and international conferences and workshops.

In the opening months of the KAUST Library, when we had about ten staff on board, the priorities of the faculty and students for the library became very clear. (These priorities, by the way, were much more concrete, clear, and immediate than our loftier overall goals of effective integration of science knowledge management into the workflow of scientific research and an enterprise based information technology organization.) Students, in particular, wanted a comfortable, attractive library facility for study, for collaborative work, and for events and programs, such as research poster sessions. This priority was met with a beautiful new facility that we keep open 24/7 and by the excellent concierge services of the library staff. Faculty, in particular, wanted networked access to the current journal literature of science. We thought this would be relatively easy to do, almost like turning a switch on, but it prove to be more demanding for both technical and administrative reasons. Although KAUST had a state-of-the-art computer network, it was new and untested, and such things as authentication processes, IP address ranges and VPN connections had not yet been entirely worked out. On the administrative side, preparing contracts with publishers through several startup intermediaries was confusing and time consuming. Although we had basic access to e-journals operational within the first three months of the first year, it really took us another year to reach comfortable maturity with this service. Working closely with IT, we resolved the technical challenges, and revised our procurement policies and practice that enables us to deal directly with the publishers involved, making for a more clarified and responsive contract agreement. Now our team from Technical Services and subject specialist from Research Services continually monitor the relevance of our e-resources in support of teaching and learning. We have also established an effective document delivery service to provide quick on-demand service for needed resources not in our electronic or print collection [KAUST, 2010].

The third priority given to us by both faculty and students was to supply course textbooks, acquiring copies both for the library closed reserve collection and for sale to students taking courses. This priority in many ways proved most challenging and tested our problem solving skills. After three years of experience and constant attempts to improve the textbook program, including application of a lean six sigma analysis, we have identified three critical factors to its success: timely and accurate faculty requests, effective acquisition of textbooks (mostly still in print format), and the desire and willingness of

students to purchase textbook. We have through a variety of strategies improved on the first two factors but not on the third. While we have gotten to the point of getting all requested textbook in on time, students have remained reluctant to buy them, purchasing less than 20% of the supply we have painstakingly acquired. We are working with students and faculty to understand this reluctance, and adjusting our textbook supply targets accordingly. One way to solve this problem would be to move entirely to e-textbooks, which would avoid the delivery delays of print material from America and Europe to Saudi Arabia. But we have found, as with all our collecting efforts, e-resources are not always available or the preferred format for science monographs. Only 25 to 30% of textbooks requested by our faculty are available as e-books. We remain a hybrid library when it comes to print and e-resources, but we are clearly moving towards e-resource dependence all the time.

By the end of year two after the opening of the KAUST Library, basic science collections and services were fully established and running well. That has allowed in year three (our current year) to concentrate on new library services that extent our responsibility into the realm of knowledge management. We are establishing a digital repository for collecting the output of our student and faculty authors; we have worked in partnership with the Chief Information Officer and his IT staff to prepare and implement a records management policy and records retention schedule for the University; we have been coordinating efforts with research and economic development offices to create an expertise system; we are staffing up our positions in archives and records management; and planning a science data management strategy for the University. Finally, we continue to explore outreach and cooperative activities with other libraries in the Kingdom and region. We are a member of UNESCO's World Digital Library, active in the Gulf Special Library Association, and we have invited many guests to KAUST to help us understand local and regional library environment.

Implementing and Coordinating Library Systems

The KAUST Library's resources and services depend on a robust technical infrastructure, including an integrated library system and digital repository that work in as parts of an enterprise computing system at the University. From its initial planning enterprise computing was a key strategic approach for KAUST as it builds its modern IT environment. This approach requires the KAUST Library to work closely with IT to ensure that library services integrate into the IT enterprise and that the Library takes full advantage of enterprise tools and resources such as the SAP system, Microsoft productivity tools, Apple equipment, the Documentum content management platform, and cloud computing strategy. Unlike most universities, where computing has developed "willy nilly" and is often highly decentralized and redundant, KAUST IT and Library could, at least at the beginning, design its information technology services using the best practices and best tools and arrange them in a logical, efficient architecture.

Enterprise computing tends to be highly centralized and rational— "building a single technical infrastructure, designed as an organic whole, that spans an organization,"[Breeding, 2009], "a strategic concern for the total computing needs of the organization" [Madron, 1991] . As part of the enterprise approach, in the early startup period of KAUST, the Library was considered a unit within the IT division, and the system librarian was a staff member of the IT team rather than of the Library. In fact, any systems, computer, or IT specialist needed by the University was required to be part of IT unit as a way to help ensure centralized implementation of IT. Although this organizational approach soon loosened up, and the Library moved to the academic division reporting to the Provost, it did require the Library and IT division to build an effective and close working relationship. The Chief Information Officer (CIO) came to see the Library as one of the important components of information infrastructure and services. The Library Director saw his relation with the CIO as one of his most important connections on campus. In fact during this time period, the Library Director wrote an editorial for journal *College & Research Libraries* on "The Rise of the CIO," and concluded, "The CIO and the Library Director's jobs are changing. The CIOs

role is clearly expanding. The Library Director's role is not so clearly being redefined in an era where content, media, and technology services merge. Often these two executive positions are on different tracks, one administrative or operational, the other academic, but in reality they both need to straddle both sides of an academic institution. Most importantly both these executives need to coordinate and integrate aspects of their work and responsibility." [Branin, 2009].

The Library has led or played a significant role in a number of systems and information services at KAUST, always in close cooperation with central IT. (There is really no other IT at KAUST.)The most fundamental system for the Library is its integrated library system (ILS), which uses the Innovative Interface's Millennium system. All the basic modules of this system are employed; including the most advanced applications for managing and accessing digital resources – such as electronic resource management, link resolver, federated search, remote access, and advanced discovery. As part of the campus enterprise strategy, we are integrating the library system with other campus software such as the course management tool in Blackboard and the procurement and finance applications in SAP. We are part of the KAUST campus "single sign on" system, and the "Smart Campus" mobile portal. This summer we plan to move server support for our ILS from a local to a remote setting as we have already done with our digital repository service, all this part of a cloud or hosted computing strategy.

The library has always considered building an institutional repository as an essential element of its services. From his experience with one of the earliest and largest institutional repositories – the Knowledge Bank at the Ohio State University [OSU, 2009] – the KAUST library director brought his strategic vision and experience to help guide and plan the implementation of our digital repository. After careful review, KAUST chose open source DSpace as the technical platform, largely due to its large user group and mature open development community and forum. Through a rigorous bidding process, we selected BioMed Central's Open Repository the best technical host for this service, based on cost, reputation, and service deliverables. Like all the other library systems' implementation, the digital repository is integrated into the enterprise blueprint. Eventually, it will be fully integrated with ILS, Blackboard, and other campus applications, such as Documentum, so we can offer faculty and students a full array of storage, preservation, and access options for their intellectual output. The KAUST Digital Archive is in beta mode right now and will be rolled out to the public in September 2012.

Conclusion

During the first two years of the KAUST Library, we worked hard to establish basic science collections and services while taking full advantage of a beautiful and functional new library facility. We put special effort into our concierge service to make the building friendly and inviting to science faculty and students, a popular, central place for study, collaborative work, meetings, lectures, and events. We found starting collections and services from scratch exhilarating but demanding. We were not burdened by legacy, but we did not have well-oiled policies and procedures that are often taken for granted in established libraries. We had no circulation policies, no technical services work flows, and a brand new integrated library system to install and learn to use. All of this in the context of a whole university and living community that was just setting up human resources, financial, security, and IT policies and procedures. The development of these basic policies and procedures --or more accurately the integration and fine tuning these new policies and procedures to work smoothly – has taken more time and effort than might be expected.

What our faculty and students wanted from us immediately was an attractive and functional library facility, networked access to the scientific journal literature, and textbooks for their courses. We met these requirements .However, our goal all along has been to create a complete modern science library that offers faculty and graduate students not only effective access to the published scientific literature, but

moves beyond this to offer broader support for scientific knowledge management: expertise management, digital archiving, metadata services, and data curation.

Into our third year of operation of the KAUST Library, we have turned more attention to these scientific knowledge management challenges. We are securing the technical tools we need for these new challenges, but most importantly we are trying to establishing new, much closer working relationships with KAUST authors and scientific researchers. Our community's small size, concentration on certain scientific areas, and our newness give us great potential to create these closer work relationships. Our subject specialists and all our staff offer good customer service, and through our basic collections work, library research training activities, and concierge services, we have built positive relationships with many students and faculty. We are stepping up to the new and more difficult political and relationship challenges of expanding the role of the library in support of the full lifecycle of scientific knowledge.

References

- AIA. (2011). AIA/ALA Library Building Awards. Retrieved April 15, 2012, from <http://www.aia.org/practicing/awards/2011/library-awards/kaust-library/index.htm>
- Boomgaarden, W. L., Confar, P., Fields, A. M., Lehman, A., Robb, J. E., & Walsh, M. P. (2010, January 19). The New Research Library: Reading And Writing Spaces for Creating Knowledge. The Ohio State University Libraries. Retrieved April 27, 2012, from <http://kb.osu.edu/dspace/handle/1811/44741>
- Branin, J. (2007). Shaping Our Space: Envisioning the New Research Library. *Journal of Library Administration*, 46(2), 27-54.
- Branin, J. (2009). The Rise of the CIO. *College and Research Libraries*, (70), 512-513.
- Breeding, M. (2009). Libraries Thrive Through Enterprise Computing. *Computers in libraries*, 29(6), 34-36. Information Today.
- HOK. (2008). KAUST: Future Now for New University City in Saudi Arabia. Retrieved April 24, 2012, from <http://www.hok.com/cfm/NewsArchiveDetail.cfm?instanceID=8b79fbd0-1422-77e3-d27e-e9999cba3f98>
- HOK. (2012). Website. Retrieved April 24, 2012, from <http://www.hok.com>
- KAUST. (2010). Library Website. Retrieved April 25, 2012, from http://library.kaust.edu.sa/screens/page_collections.html
- KAUST. (2011a). Financial Operations Plan and Budget 2011-12, 5.
- KAUST. (2011b). Global Research Partnership. Retrieved April 24, 2012, c from <http://www.kaust.edu.sa/research/grc/grp.html>
- KAUST. (2011c). Financial Operations Plan and Budget 2011-12, 3.

KAUST. (2012). Library Staff Directory. Retrieved April 24, 2012, from http://library.kaust.edu.sa/screens/page_meetstaff.html

Madron, T. W. (1991). Enterprise computing in higher education. *T.H.E. Journal (Technological Horizons in Education)*, 18(11), 60-65.

OSU. (2009). Knowledge Bank at the Ohio State University. Retrieved April 16, 2012, from <https://kb.osu.edu/dspace/>