



University *of* Richmond

Appendix: Technology Report



Technology Report

INFORMATION SERVICES DIVISION MISSION

“The mission of Information Service at the University of Richmond is to plan, create, and manage an information environment that enables members of the university community to utilize information resources effectively, productively, and securely. We strive to support excellence and innovation in teaching, learning, and research and to support efficiency and productivity in administration. Information Services partners with faculty, students, and staff to identify the needs of the university community; provides appropriate infrastructure and tools to enable work and promote discovery; and helps offices and individuals meet their goals.”

Our observations based on meetings, on-site tours, phone discussions, and document reviews, is that the Information Services (IS) division exhibits an impressive adherence to this mission. Information Services at the University of Richmond combines information technology services and the library into one organization. As stated in the most current program plan, “The IS division strives to provide faculty and students with information resources and services that enable them to excel in their academic pursuits.” For example, IS staff participate as members of the Faculty Enrichment Advisory Group in support of faculty development while learning first-hand what support and resources faculty need to be successful in teaching and scholarship.

CLASSROOM AUDIOVISUAL SYSTEMS

During our initial meeting on campus, we visited a representative sampling of classrooms. While we did not visit classrooms in each building, we believe we saw enough spaces to assess the general conditions of the systems and understand the present approach to classroom instructional technologies. In general, the systems are well thought-out, neatly installed, responsive to faculty needs and superior to many other higher education institutions.

STANDARDIZATION

The most notable observation is the clear effort towards standardization of the equipment. Standardization offers a number of benefits such as reduced training needs, improved ease of use, simplified support and reduced inventory for spare parts and consumables such as projector lamps. Planned correctly, standardization often brings a lower overall total cost of ownership.

Given that systems are installed in phases over months and years, it is nearly impossible to have identical systems in all rooms across a campus the size of UR. Model numbers of the certain items change frequently and cannot be consistent from year to year. However, UR has made considerable progress in standardizing rooms in a logical way.

Arguably, the most important area for standardization is the user interface of the control system that allows the presenter to operate the audiovisual systems. With a few exceptions, regardless of the various individual components, a consistent user interface can deliver a consistent user experience. UR has standardized on AMX control systems.

AMX, one of the top two firms in the control system market, offers a complete line of products for system and room control, ranging from large and sophisticated touch panels to less expensive push-button wall panels to apps for iPads, smart phones and other mobile devices.

Control systems are no longer simply the most efficient method of operating systems; they are often integral to the audiovisual system, providing functions such as remote management and support, signal routing, signal distribution, signal processing, power management, audio DSP and audio power amplification, among other functions. Further, more powerful control systems, such as AMX, can provide connections to “non-AV” items such as occupancy sensors, thermostats, window treatments, lighting, security systems, scheduling systems and so on. These connections can grow into a complete Intelligent Building System over time.

Thus, the decision to standardize on a certain control system platform is a critical and strategic decision that is difficult to change if a poor decision is made. As a company, AMX is committed to delivering innovative products and solutions which should allow UR to continue to grow and expand system capabilities and help fulfill the faculty requirements.

We see no reason for UR to change their standardization on the AMX platform.

BALANCE OF STANDARDIZATION & DIFFERENTIATION

Even given all of the benefits of implementing standardized solutions, no single system design or approach can satisfy all of the varied needs for a campus such as UR. A balance must be maintained between standardization and allowing differentiation among various departments. A proper balance was observed at UR, reflecting an effective approach to technology planning. While classroom upgrades are often focused on capturing the benefits of standardization across classrooms, resulting in a solid base of standardized classrooms, the University remains flexible to providing specialization when a program requires and benefits from it. Maintaining this balance is a constant challenge, particularly over and past several years, given continuous technology developments, interest by faculty to have the latest devices and the inevitable budget constraints.

For example, accurate color, high resolution, and precise detail for analyzing film and art imagery are critical to some classes in the “Art and Art History” and “Film Studies” programs. These unique requirements extend beyond the capabilities of standard classroom equipment. Video projectors from Canon Professional Imaging provide the consistently sharp color fidelity needed by these classes. While this capability carries a cost premium, faculty in these areas are quite pleased with the results. Deviation from the standard also extends to surround sound and acoustical considerations. This differentiation is an excellent example of a campus technology effort that is willing to be flexible when needed.

An overly strict adherence to a standard can be too limiting and suffocate attempts to be innovative. Approaching each new initiative or opportunity to improve with an attitude of “this is how we do it” is a destructive force, sadly seen on many campuses, that stifles open dialogue about the role of technology in supporting teaching, learning and research. This excessively stringent loyalty to a standard approach is not evident at UR.

For a campus technology strategy to be effective over the long-term, a balance of Standardization vs. Differentiation must be understood, supported by the proper decision makers within the campus administration and funded appropriately. Maintaining this balance is difficult on a campus the size of UR.

One method to achieve this balance of allowing standardized implementations in classrooms and still supporting innovation with new tools is to create a specific space dedicated to experimentation and chartered to investigate new pedagogies and teaching tools. The space should be considered a campus-wide asset and not scheduled as a typical classroom through the Registrar Office. Other important components of such an effort include a budget for new tools (recognizing that some items may be donated or loaned by various vendors), a tolerance for failure and adequate staff time and incentive to experiment. These spaces are often referred to as “black box classrooms” or “sandbox spaces.”

CLOSE TIES TO AN AUDIOVISUAL SYSTEMS INTEGRATION FIRM

The campus has a strong relationship with a local audiovisual systems integrator, who supplies, installs and services the systems. The connection is long-term and appears to be a healthy two-way partnership more than merely a supplier-customer relationship. While the procurement policies of some campuses do not allow such an arrangement, UR clearly benefits from this approach and we do not sense a reason to change the relationship; however, we offer the following comments and cautions.

Technology providers in this position will often charge a cost premium, commensurate with the first-rate service and attention. One caution is that this relationship can evolve into such a comfortable arrangement that this cost premium can go unchecked and grow into an unfair level. We did not discuss pricing with UR staff and are not suggesting this has happened; however, we have seen this happen with other organizations.

One strategy to mitigate this risk is to periodically conduct a competitive bid for a project, allowing a true price comparison for identical products and services. This cannot be done correctly and fairly with a performance-based approach or a loosely defined specification. A tightly prepared “hard spec” is required. This offers true price comparisons and gathers ideas from other audiovisual systems integrators, who will often submit other alternatives and options to consider, in addition to the specified products and approach. Spot checking the prices of individual items will not produce the desired results and is not recommended. UR has confirmed that

they currently mitigate risks by doing periodic comparisons of other solutions/vendors on an on-going basis. UR’s contract with their AV Partner allows bid evaluation pricing on equipment and labor in order to get the best possible work at the best possible price.

Further, we understand that UR follows a consistent strategy with their technology partnerships by taking advantage of manufacturer partner programs. These programs often provide special discounts, points programs for past purchases, technical training and certification, access to support, and other incentives. While these benefits can often be overlooked when a campus has a long-term relationship with a single provider, this has not been ignored at UR. For instance, the University actively participates in the Education Alliance Program offered by AMX demonstrating a commitment to these recommended strategies.

Another factor to consider with respect to relationship with the audiovisual system integrator is the ownership of source code that operates the AMX control systems. Each control processor (typically one per classroom) is loaded with software written in a propriety programming language and developed specifically for that individual system. Modifications to the system hardware will typically require modification to the control software, which requires the proper un-compiled “source” code. Without such source code, any modifications to the system require writing the software from scratch; costs for this service will vary with system complexity but are often in the \$2,500 - \$8,000 range and can be \$20,000 or more for a complex system.

Where custom software is developed as part of a project, the system source code, passwords, and any associated related files and licensing used to compile, develop, and build the executable code should be provided to UR by the audiovisual system integrator. Software industry standards should be followed, including proper documentation, referenced files and so on. Importantly, the campus should own all rights to, at a minimum, modify the code for its' own use for that specific project and re-use the graphical layout for other campus projects. There are a number of details and nuances to software agreements; this short discussion is merely an overview of the most important factors related to your classroom systems.

Other than the factors mentioned above, over-reliance on a single firm does not typically pose a risk to the campus, as there are a number of other local audiovisual firms that would be eager to serve the campus, should the relationship be threatened or terminated.

Future Challenges

CONTEMPORARY PEDAGOGIES

A primary goal of the Information Services division is to be responsive to the needs and requirements of faculty. The challenge is that these needs and requirements are varied and constantly evolving. For example, the faculty may shift towards “flipping the classroom” or more “active learning.” Clearly, there is a strong move toward these pedagogies on numerous campuses across the country.

For most campuses, this translates into reducing the time students spend in a passive lecture mode, introducing more engaging in-class learning experiences such as group learning and problem based learning. Out of class work becomes the more passive activities, such as watching on-line presentation materials.

While not a “new” pedagogical strategy (even Confucius talked about it), active learning can be far more impactful now with today’s technology tools supporting collaborative group work, personalized individual work, robust network access, inexpensive production tools and so on.

This transition forces radical change on some campuses, causing a rethinking of class sizes, room sizes, room schedules, roles of teaching assistants, faculty skill sets, instructional materials and so on. For those institutions, the technology changes are the “easy part” of the equation.

The UR challenge will be different than most campuses, which are often installing active learning classrooms for 70 – 100 students, or more. (For example, the University of Virginia Medical School has one of the largest such rooms, with 168 students.) Of course, the UR class sizes are wonderfully small in comparison and faculty

report they are already doing far more active learning activities than is typical. Thus, many of the macro issues and obstacles do not apply at UR.

The IS division is ready, willing, and able to respond to changes in technology, infrastructure, or spaces but prefers that these changes be driven by faculty, who may want to teach in a particular way. For example, the Assistant Vice President of Telecommunications, Media Support and User Services confirmed that, if it can be determined that an active learning space, such as a SCALE-UP, TEAL or other popular approach, is needed to support a particular (or new) pedagogical style, the required technology can be implemented.

UR recognizes there is a need to continue to adapt technology solutions to meet the changing needs and teaching styles in their classroom spaces. This extends to lighting, room acoustics, furniture, and so on. The IS division working alongside the Office of the Registrar, University Facilities, the Classroom Committees in planning efforts will continue to be key. An example of this effort can be seen in the library where observation studies have been conducted to see how students work together, the technologies they use, and the types of furniture configurations that are most favored.

A few of the *technical* challenges to support these contemporary pedagogies will be:

- *Lecture Capture Systems.* Students expect immediate access to information when they want and Lecture Capture systems that record appropriate classroom activities for viewing later on-demand offer this capability. Classroom capture and recording are emerging

requirements at UR. This is planned as a phased roll-out, likely starting with the Law School, and should eventually be implemented in virtually all classrooms on campus. There are many challenges presented by an enterprise lecture capture system because there is often no logical starting point for deployment.

As planned by UR, a phased roll-out with a focus on one area is most practical. Faculty adoption and training, securing intellectual property, storage and network bandwidth, indexing and use of metadata, and support are some of the challenges. For partner selection, UR is currently evaluating a number of proven and robust solutions from multiple manufacturers while also reviewing best practices. “Lecture capture and retrieval tools have been shown to have positive effect on student grades and retention, and they promise to be important pedagogical tools. The ability to index lectures and the ability to offer playback of selected passages have proven key to these positive results,” reported Marti Harris, Gartner research analyst, in the Hype Cycle for Education, 2011. “Practical benefits of lecture capture include review, improved scores, improved retention, convenience, and a new option for students to make up planned or unplanned absences.” Selected systems should have the appropriate “back-end” to manage the content and integrate into the Blackboard Learning Management System.

- *Production Tools.* Hardware and software tools for creating on-line instructional materials for viewing outside of class must be affordable, scalable and, above all, easy to use. Audio/ video capture should not be confined to one

specific high-end, professional-grade studio on campus, nor be done by individual faculty members with consumer-level equipment in their offices. A plan to support multiple faculty members at an appropriate level of production value should be developed and implemented.

- *Collaboration Systems.* To support effective group-work within class typically requires a combination of hardware, software and network configuration. This is an emerging class of technologies, offering an exciting range of tools from inexpensive and low-end products to highly sophisticated options.
- *BYOD (Bring Your Own Device) Support.* UR is a BYOD world and the “wearable computing” movement is in its’ infancy. Personal communications devices – and the expectations of the users - pose risks and challenges for the IT environment including bandwidth, network stability, storage, security, support staff and other resources. UR continues to pilot mobile tools using iPads on student engagement and learning. Faculty, too, can be seen carrying iPads on campus and are looking for innovative ways to integrate them into their classrooms.
- *IPTV and streaming video.* Video assets, viewed on demand over the network, will eventually replace checking out DVDs and legacy video media. Currently, UR has a mini-head end for video distribution using Dish Network to provide multiple channels including eight channels allocated to Film Studies. A longer term solution will likely involve a server-based video on demand system.

- *Media Asset Archiving and Management.* More and more instructional and reference materials will need to be available online. Older materials and resources will need to be digitized or replaced; these may include hard-to-find or one-of-a-kind resources. Licensing, copyrights, and permissions for existing materials must be reviewed on a case-by-case basis. Currently, UR is not serving up digital media for on-demand viewing via the web as there has been little demand on the academic side. The University recognizes the usefulness and need for an enterprise Content Management System (CMS) for electronic documents, emails, and images on the administrative side. Tools would typically fall within the Media Resource Center and could serve the larger community. The IS division is developing a roadmap for the CMS and proposal to support expanding digital collection efforts.
- *Instructional Design.* Faculty support will be needed for modifying existing instructional materials including audio, video, graphics, animation and other online content to fit new pedagogies. Published assets must be archived, indexed, well-organized and searchable in order to encourage student and faculty use and analysis. An enterprise content management system will be required. UR's Information Services is structured to provide faculty support through The Center for Teaching, learning, and Technology (CTLT) liaisons.
- *Common Spaces.* The Classroom Oversight, Coordination, and Implementation Committee's (COCIC) goal to support renovation of informal learning spaces is an important effort, particularly if the classroom activities evolve to become more collaborative and small-group centered. These "third spaces" are necessary but sometimes overlooked areas where students collaborate outside of the classroom, use technology, charge BYOD devices, establish community and extend learning beyond the walls of classrooms. UR is reviewing informal student gathering spaces as opportunities to provide the best learning environment possible both in and outside the classroom.

In addition, a few of the non-technical challenges to support these contemporary pedagogies will be:

- *Faculty Development.* Faculty skill sets must be developed not only in using some of the new technologies (which is the easy portion), but also in the best practices of working effectively within new pedagogical models. Tangible encouragement from campus administration such as use of outside experts, appropriate "release time" and/or stipends should be considered.
- *Technical Support.* Technical staff requirements will increase as the teaching and learning process becomes even more technology-dependent. Adequate resources for the professional development for technical staff should be allocated.

CONTROL SYSTEMS

The following items related to control systems have been discussed:

- *AMX Resource Management Suite.* There is significant progress toward making UR an “AMX Connected Campus.” UR is approximately half-way through implementation of the AMX Resource Management Suite across 200 spaces. This allows centralized and remote management of audiovisual (and related) AV assets, remote monitoring and a collection of AV-focused data to help manage audiovisual systems in a more proactive and informed fashion.
- *AMX Rapid Project Maker.* UR is monitoring the progress and development of a new AMX product, Rapid Project Maker. This is a cloud-based service that would allow the campus to perform their own AMX “configuration” (not programming) for select, simple systems in a conference room or classroom. For the right application, it can be deliver significant time

and money savings; however, outside of the ideal application, it is not an appropriate tool. Simple classroom systems at UR may not fit the “ideal” RPM model, but this is worthy of further research and consideration. Of course, as the classroom systems get more sophisticated to support some of the capabilities described above, the likelihood of RPM being suitable is decreased. UR has evaluated RPM and does not believe it makes sense to deploy and use at this time; however the IS division will continue to monitor development of the product.

- *Wireless Control.* Faculty has expressed interest in using Apple© or Android TMwireless devices for control interfaces. These solutions are not as reliable as traditional AMX solutions and may not be acceptable to the campus IT group due to security concerns, but should be considered as supplements, not replacements, for more traditional AMX solutions.

OTHER CHALLENGES

- *Digital Signal Distribution.* Given the phase-out of the venerable VGA connector on computing devices, the transition of signal distribution from analog to digital should continue and will require funding. New typical classroom installations will continue to offer support for analog devices. Differentiated programs, such as Fine Arts or Film Studies, may have legacy analog video devices that may remain for the foreseeable future. Eventually, consumer demand and the industry will phase out older technologies and the need to support them. UR will continue to investigate additional options during refresh of older technologies utilizing AMX's Resource Management Suite to look at usage statistics and to anticipate where older technologies may be phased out. The IS division will continue to offer support for both digital and analog signal distribution methods.
- *Technology Refresh.* A technology refresh plan is in place, with a five-year replacement cycle for most audiovisual components. This is an appropriate strategy which provides further justification for a given spend. As audiovisual systems become more software-dependent, the service contracts, upgrades and maintenance fees associated with the software may exceed the refresh budget. As the amount of hardware decreases over time, the hardware refresh cost may decrease, but not likely at a level to off-set the software cost increase. Further, it will be several years before the hardware level decreases significantly, as many current solutions are software-based but require either additional or specialized hardware. Eventually, the hardware cost will decrease significantly to help off-

set the additional software operating costs, but that point is several years away. UR's current planning efforts address these future challenges and opportunities.

In addition, the IS division continues to work with the Office of Sustainability to develop a plan for reuse, recycle and disposal of technology equipment as appropriate.

- *Preventive Maintenance.* A proactive and efficient preventative maintenance schedule at UR checks classrooms twice per year. Projector lamp life is monitored through the AMX RMS system which allows the campus to plan for lamp replacements and budget accordingly. This practice also minimizes classroom disruptions or outages when lamp service is due. This level of service is often more of a struggle on some campuses than it appears to be at UR.

Projector technology continues to advance making projectors more efficient in operation while extending internal lamp life. In addition, the introduction of solid state technologies and laser-based projectors lowers the total cost of ownership by removing lamps and filters, and the required labor hours associated with their preventative maintenance; projectors based on these technologies carry a higher first cost and must be budgeted appropriately.

- *Classroom Environments.* Faculty mentioned isolated issues with lighting, lighting control, window treatments and acoustics. In addition to other issues created, each of these may limit the effectiveness of the audiovisual systems. Room issues should continue to be addressed as needed.

- *Dual Image Projection.* Projection of multiple images simultaneously in the classrooms has gained popularity in Higher Education for its ability to extend display of information for improved retention, support images from multiple sources and allow critical analysis of information such as “compare and contrast” opportunities. In addition to the additional cost and complexity involved, however, dual screen projection can also reduce the amount of available writing surface so should be considered carefully. UR has found that multiple projection screens are worthwhile for the appropriate courses, again maintaining the balance of standardization and differentiation.
- *Whiteboards.* Faculty have expressed the need to keep white board space available in classrooms as a priority. Use of white boards at the same time as multiple projection screens often requires taller ceiling heights that are not practical outside of tiered classrooms and auditoriums. In some rooms, the projection screen can be offset to the side to allow more exposed white board surface. Alternately, dual screen can be achieved using one projection screen and windowing hardware and software. In the right-sized space, this is a way to keep more writing surface. Alternately, electronic annotation can be used where a document camera or an annotation tablet is used to write using the projection screen as the display surface. UR has and will continue to explore all of these options while being proactive in understanding faculty needs and requirements.
- *Visualization / Display Developments.* Development in display options such as 4K resolution, 3D modeling, tile walls, blended projection, projection mapping, flexible displays, interactive technologies, and sophisticated simulations offer students innovative learning experiences and scholarship opportunities. Fulfilling the Richmond Promise may require using these advanced technologies. For example, the UR Digital Scholarship Lab (DSL) has unique projects underway; some of these projects would benefit from these capabilities. Challenges here include identifying relevant technologies, funding, staff development and scaling the efforts to increase student involvement.
- *Virtualization.* IS has launched Apache’s Virtual Computer Lab architecture, a free and open-source cloud computing platform with the primary goal of delivering dedicated, custom compute environments to users via virtualized desktops. Ultimately, virtualization lowers cost, extends reach, and streamlines support. This initiative can extend its reach to students in the community and even studying abroad. Virtualization continues to be an exciting technology development and is spreading to select AV components such as audio DSP.
- *Big Data.* Massive data sets and the availability of user analytics and interaction data helps predict student success, allows material to be searchable and tailored to improve learning outcomes, and identifies performance gaps. Many people believe that predictive analytics will positively impact efficiency and effectiveness of higher learning and ultimately drive decisions about classroom activities,

thus impacting the classroom technology environment. The IS division will continue to monitor development and the impact of these tools.

- *Intelligent Campus.* Intelligent Building systems allow sophisticated monitoring and management of all of the various disparate subsystems in the building such as BAS/BMS, lighting, audiovisual, occupancy sensors, paging, IT, security, parking garage systems, window treatments and so on. While still maturing, these tools allow campuses to consider an Intelligent Campus, linking all buildings together into a central dashboard. The AMX RMS, for example, can be extended to be the central dashboard of an Intelligent Building or Intelligent Campus System. The IS division, in coordination with Facilities and other campus groups, should monitor the development of these systems and plan for implementation at the optimum time.
- *Social Media.* Nationwide, there is disagreement among faculty and staff about the usefulness of social media in classrooms. Some believe that learning fitting a social-based paradigm will keep students engaged, active, and participating while meeting the diverse needs and learning styles of students, while offering another way to accommodate discussion in and out of class. Others believe social media to be unproductive distractions. The IS division can assist the faculty in reaching a consensus about the role of these tools on campus. Should the campus decide to proceed, the challenge is select the proper enterprise-level tool(s), standardize policies around the tool(s) and promote adoption.

Training of both faculty and students will be important.

- *Web Conferencing.* Software-based codecs offer ways for individuals, groups, and classes to interact with others without boundaries through video-based web conferencing. UR has begun to incorporate Skype and Adobe Connect into the standard multimedia capability. While single user camera systems, often found on personal devices and laptops, are adequate for one-on-one discussions, higher quality group-based web conferencing requires additional planning with the integration of higher resolution wide-angle cameras and room-based microphones for pickup of quality audio for larger spaces. Adding microphones to the classroom environment brings challenges related to cabling, furniture flexibility, maintenance and the overall acoustical environment.
- *Digital Signage.* Digital signage has become an essential part of a well-connected campus community and has extended beyond the student commons to many other areas across a campus. Departments such as admissions, the library, food services, and campus security find digital signage a platform that supports their goals and efforts. A standardized and centralized digital signage system with secure access by multiple administrators, using formalized gatekeeper approval, and support for emergency messaging overrides is a good enterprise communications strategy. UR has provided a starting point for standardization of campus-wide digital signage adopting Visix Axis-TV. This feature-rich system can be expanded to offer interactive wayfinding, room

scheduling, and promotion of sustainability efforts to display energy dashboards. Challenges for the future include content creation and refresh, training, continued standardization and the addition of new features such as wayfinding and interaction.

- *Emergency Communications.* Traditionally, emergency communications systems have been stand-alone systems with no connection to audiovisual systems. Recently, audiovisual components such as digital signage displays, paging loudspeakers and even projectors have begun to interface with the building's emergency communications systems. For example, in the event of an emergency, messages can be automatically pushed to digital signage monitors and classroom projectors throughout campus. This is a worthwhile endeavor and should be strongly considered.
- *AV over IP.* With the convergence of audiovisual and information technologies, careful planning must occur to ensure both IP-enabled audiovisual systems and AV-provisioned networks. Network outlet locations, port quantities, WAPs and network switches must meet the emerging standards of distributing AV signals over IP networks such as Dante and AVB. Bandwidth availability should also be considered for more intensive IP-based AV applications. While items such as control system processors will simply send and receive control code, items such as videoconferencing codecs and media streaming appliances will have higher bandwidth requirements to accommodate the delivery of audio and video over the network.



1040 Hull Street, Suite 100
Baltimore, MD 21230
410.347.8500



28 Westhampton Way
Richmond, VA 23173
804.289.8000