SYNERGETIC STRATEGIES IN THE DEVELOPMENT OF MUSIC TECHNOLOGY AND MULTIMEDIA IN THE NORTH AMERICAN HEARTLAND

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ABSTRACT
The University of Nebraska at Omaha has a new undergraduate concentration in Music Technology. With this concentration are newly dedicated facilities, new faculty, and a fresh approach to Audio Production as it pertains to Multimedia. This studio report outlines the collaborative efforts that helped create innovative Music Technology programs at the University of Nebraska at Omaha. It spells out its philosophies, shared resources, and its ambitions to be a leader in Information Technology innovation via the inclusion of Music Technology within an Information Science degree and through the development of the Music Technology program within a Music Performance Degree. Collaboration made these programs viable and pertinent, and it is hoped that this synergetic approach can be used as a model to start Music Technology/Multimedia programs in other academic institutions that face the same challenges normally associated with being situated within isolated geographical areas.

1. INTRODUCTION
Located within the rural Heartland of the United States, the new Music Technology program at the University of Nebraska at Omaha (UNO) combines the resources of the College of Communication, Fine Arts, and Media (CFAM) with the College of Information Science and Technology (IS & T). The specific departments within each college include the Department of Music (MUS) of the College of Communication, Fine Arts, and Media and the Department of Information Systems and Quantitative Analysis (ISQA) within the College of Information Science and Technology. The Department of Music is physically housed in the Strauss Performing Arts Center (SPAC) on the North Campus. Located on the South Campus, the Department of Information Systems and Quantitative Analysis is housed in the Peter Kiewit Institute (PKI) of Information Science, Technology, and Engineering. The collaboration has helped to create a music degree program that is unique in the state of Nebraska and an innovative information technology program that could serve as a model for other medium-sized universities who must creatively consolidate resources to create new programs.

2. COLLABORATIVE STRATEGIES AND SHARED RESOURCES
2.1. Shared Facilities
Through collaboration between the UNO College of Communication, Fine Arts, and Media and the College of Information Science and Technology, Students and faculty in Music Technology at the University of Nebraska at Omaha can avail themselves of the shared facilities of the Strauss Performing Arts Center and the Peter Kiewit Institute.

2.1.1. PKI 375 – Multimedia Lab
Located at the Peter Kiewit Institute, the Multimedia Lab was created for study, research, and creative activity in multimedia technology. This includes graphics, 3-D animation, video and music, and digital audio synthesis. The Multimedia Lab was used in the implementation of the Lewis, Clark and Beyond project. Funded by the National Park Service, the project yielded an extensive online database of web resources for educational purposes and for the celebration of the Lewis & Clark Bicentennial. Future projects in this lab will include Performing Arts Technology research in Second Life. Currently, the Department of Information Systems and Quantitative Analysis is developing an art gallery within Second Life and is also conducting research involving the use of Second Life in establishing a working business environment. In the continued spirit of collaboration, The Department of Music’s Music Technology area is scheduled to collaborate with ISQA’s Multimedia Lab to create a performing arts concert hall in Second Life. Music Technology courses that are taught in this room include MUS 3170 Introduction to Music Technology, MUS 3180 Digital Synthesis, ISQA 2000 Special Topics: Introduction
to Audio for Multimedia, and ISQA 2000 Special Topics: Virtual Music.

The Multimedia Lab consists of a total of twenty workstations plus a teacher workstation. Five of the student workstations are Macintosh machines and the remaining stations are Windows machines. Workstations in this lab are considered “old” after two years and are redistributed to other labs or sold to third parties at the two-year mark. Keyboard controllers and MIDI interfaces are available for all workstations. Many student projects do not require keyboard controllers, so many have been removed and relocated to a storage area. In addition to video editing software, all the Windows machines contain the following music technology software: Max/MSP/Jitter, Cakewalk Sonar, Reason, and Finale. All Macintosh machines contain Max/MSP and Digital Performer. One of the Macintosh machines is part of a larger workstation that includes several peripherals including a MOTU 828 and several hardware synthesizers.

2.1.2. SPAC 153 – Studio 153

Studio 153 is the main recording studio for the UNO Department of Music, and delivers all audio recording services for a very active music department. The Control Room is patched to two large adjacent dual-purpose rehearsal rooms/recording rooms as well as the Recital Hall. The Adjacent rehearsal rooms can double as recording rooms for studio recordings, but the Control Room itself has a separate recording space for isolating drums or vocals. Most artists, especially artists that rely on overdubbing, prefer to record in the Control Room area. Almost all concerts are held in Recital Hall, and all concerts are recorded for the UNO Audio Archives. In addition to an archive CD and server backup for each concert, an audio CD is always hand-delivered to the soloist or ensemble leader immediately after the concert. In addition, students may also access the password-protected Studio 153 File Server via the Internet, and download their performances. This is especially useful for recitals that have multiple soloists. Students in both Audio Recording classes, MUS 4200 Audio Recording Techniques I and MUS 4210 Audio Recording Techniques II, and students enrolled in MUS 4290 Technology Capstone utilize Studio 153 on a regular basis.

The heart of Studio 153 is a Pro Tools HD System running Pro Tools LE. The hardware allows for recording 16 simultaneous channels. The studio has an extensive collection of microphones including one B.L.U.E. Cactus, a pair of B.L.U.E. Kiwi microphones, a pair of Neumann 103 TLM microphones, a pair of Neumann KM 184 microphones, a pair of Neumann KM 183 microphones, a pair of Earthworks TC30 microphones, a Shure PGDMK6 Drum Mic Kit, a bin containing a large number of Shure SM57, SM58, and Sennheiser E 935 microphones, a pair of AKG 414 microphones, a pair of AKG C 1000S microphones, one AKG C3000B, several Audio-Technica AT825 microphones, and a collection of various miscellaneous microphones. Several preamps are utilized including a Grace Design 201 preamp, a Focusrite Red preamp, and an Avalon 737. A/D & D/A conversion is implemented with an Apogee Rosetta 800 192k and routing is implemented with a Z Systems router. Like most studios, Studio 153 has an odd assortment of reel-to-reel tape machines, cassette recorders, DAT machines, and other legacy hardware.

2.1.3. SPAC 130 Music Computer Lab

The Music Computer Lab at the Strauss Performing Arts Center is the main teaching lab for Music Technology Courses as well as providing a lab for ear-training students and composition students. MUS 3170 Introduction to Music Technology and MUS 4200/4210 Audio Recording Techniques I & II are taught in this computer lab.

There are twelve Windows Stations each with an Oxygen keyboard controller. There are two additional workstations. One is a Windows station that is used as the instructor’s station and the other workstation is a Macintosh running Pro Tools on OS X with a Digidesign 001 as its audio interface. All the Windows stations have Cakewalk Sonar Producer Edition, Pro Tools LE, and Finale. In addition, two of the Windows stations have Max/MSP, another PC is a Reason workstation, another uses ACID, and one workstation is a station utilizing Gamestudio for game audio.

2.1.4. SPAC 270 Post Production Studio

The emphasis of the Post-Production Studio is computer-based creative work with little use of recorded acoustical instruments. Some limited recording work utilizes the adjacent isolation booth, but most work takes advantage of the various hardware and software synthesizers and outboard effects processors that are installed in the room. Wide ranges of activities are realized in this room such as soundtrack composition, video production, audio editing, MIDI sequencing, sound design, and synthesis. The music produced in this room ranges from commercial music to academic computer music.

The Post-Production Room hosts a Macintosh-based Digital Audio Workstation running Pro Tools with a DigiDesign 002 Audio Interface and a PC running GigaStudio. Plug-ins include Antares Auto Tune and the Waves Gold Bundle. The Macintosh also runs Max/MSP/Jitter. The hardware synthesizer racks include a Roland V-Synth XT, a Korg Triton-Rack, a Kurzweil PC2, a Yamaha EX5, and a Roland XP30. Software synths include Propellerhead’s Reason. The sample library includes the EastWest/Quantum Leap Symphonic Orchestra, Synthogy Ivory, and the Vienna Symphonic Library. The SPAC 270 system also functions as the ready backup in the event of catastrophic failure of the Studio
153 system, and is also the system that is utilized for 8-channel concerts.

Figure 1. Multimedia Lab at Peter Kiewit Institute

2.2. Shared Faculty

One full-time faculty member, Jeremy Baguyos – Assistant Professor of Music Technology and Artist Faculty of Double Bass, is retained as a dual-appointment between the College of Communication, Fine Arts, and Media and the College of Information Science and Technology. This faculty member teaches courses and conducts creative/research activity for both colleges. This collaborative position is critical in the coordination of Music Technology and Multimedia activities and resources between the two colleges. The faculty member’s main office is located in the Strauss Performing Arts Center, but there is also a utility office at the Peter Kiewit Institute. The full-time faculty member also coordinates a pool of adjunct instructors and support staff, and also works with full-time faculty who teach and research within music technology and multimedia as a secondary area.

2.3. Shared Courses

Music Technology courses can count towards two separate degrees in two separate colleges. Within the College of Information Science and Technology, Music Technology courses count towards the new Bachelor of Science in IT Innovation – Music Emphasis. Within the College of Communication, Fine Arts, and Media, the Music Technology courses count towards the Bachelor of Music in Performance – Music Technology Concentration. Incidentally, to demonstrate the very interdisciplinary nature of this area of study, Music Technology courses can also count towards University of Nebraska at Omaha degrees in Communication and Broadcast Media.

- MUS 2740 Music Technology Ensemble – Ensemble A.M.I. (ARTificial Music Initiative) (1 credit)
- MUS 3170 Introduction to Music Technology (3 credits)
- MUS 3180 Digital Synthesis (3 credits)
- MUS 4000 Special Studies in Music: Composition for Technology (1-3 Credits)
- MUS 4200 Audio Recording Techniques I (3 Credits)
- MUS 4210 Audio Recording Techniques II (3 Credits)
- MUS 4290 Music Technology Capstone (3 Credits)
- ISQA 2000 Special Topics: Introduction to Audio for Multimedia (3 credits)
- ISQA 2000 Special Topics: Virtual Music (3 credits)

3. ETHOS

The Music Technology Concentration within the Bachelor of Music program combines the rigorous training of a traditional university music program, a practical hands-on approach through real-life opportunities, and a digital audio curriculum that combines platform-independent core competencies with emerging technologies and aesthetics. The program instills the musical sensibilities of a classically trained musician and the technical savvy of a Digital Audio Specialist. Most importantly, the program’s broad preparation and multi-disciplinary outlook prepares students to adapt to the ongoing technological transformation of the music profession and the creative arts.

The Music Emphasis within the Bachelor of Science in IT Innovation combines courses in Information Technology with elective courses from the Department of Music. The selected courses are drawn from Music Technology courses as well as traditional courses in Music Theory and Music History. The program instills the core competencies of an IT professional with the creative sensibilities of a musical artist. The program’s flexibility allows self-motivated students with dual interests in Information Technology and Music to create their own academic and professional opportunities within the ever-changing landscape of technology disciplines requiring creativity, technology-dependent disciplines in the arts, and/or multimedia disciplines with digital audio components. The program recognizes that the successful implementation of Information Technology can be facilitated with a cogent and coherently designed curriculum that reflects the inextricable combination of music and technology. The Bachelor of Science in IT Innovation degree program began accepting students in the Fall of 2009 and was created by Dr. Gerald Wagner.

4. CREATIVE ACTIVITIES THROUGH COLLABORATION

4.1. ArtsAha!

The University of Nebraska at Omaha in conjunction with the Analog Arts Ensemble, hosts ArtsAha!, Omaha’s new
music festival. The 2007 festival ran from September 7 through September 15. The electronic highlight of the 9-day festival included a realization of George Antheil’s *Ballet Mécanique* replete with multiple computer-synchronized player pianos, the corresponding film *Ballet Mécanique* by Fernand Léger, electronic sirens, electronic bells, electronic propellers, live percussion, and live pianists. In addition, an all-electronic concert with video projection was produced in collaboration with the Mallory Kountze Planetarium. Electronic highlights from the 2008 *ArtsAha!* Festival included the United States premiers of two electronic works by Karlheinz Stockhausen, *Cosmic Pulses* and *Friday’s Greeting* from the Licht Cycle. The performance of *Cosmic Pulses* was significant not just as a US premier, but as a public performance of Stockhausen’s last electronic work. In addition, the technical requirements of the work involved the use of five subwoofers in addition to the standard eight full range speakers. The collaborative spirit between UNO and the Analog Arts Ensemble has allowed both organizations to combine resources and elevate the profile of everyone involved with the *ArtsAha!* Festival.

### 4.2. Technology Ensemble – Ensemble A.M.I.

The UNO Technology Ensemble, named Ensemble A.M.I. (Artificial Music Initiative), performs in a variety of genres including real-time interactive computer music, laptop ensemble music, commercial music, multimedia, and improvisation. The ensemble’s repertoire includes music where technology occupies an essential role. Membership is drawn primarily from the Department of Music and the Department of Information Systems and Quantitative Analysis. The Technology Ensemble is a curricular elective for degree programs in both departments. In 2008, A.M.I. performed three concerts. The first concert, led by UNO Composition/Music Theory faculty and A.M.I. founder, Ken Bales, featured new works as well as classics including Brian Eno’s *Music For Airports*. The second and third concerts featured performances of interactive computer music including Andrew May’s *Ripped-up Maps*. In 2009, Ensemble A.M.I. presented Virtual Music Week, Nebraska’s first Electronic Music Week. The highlight of the week included a collaborative performance with Stanford Laptop Orchestra within Q3OSC, Robert Hamilton’s networked video game environment in addition to three concerts of interactive computer music and fixed media works. Spire Artist-in-residence Robert Hamilton delivered lectures and demonstrations of his award-winning Q3OSC research, lectures on his work in bioinformatics, and narratives of his experience with technology transfer. In addition, Robert Hamilton’s *Giants* for 6-channel electro-magnetic resonance guitar, interactive computer, double bass, and iPhone controller was premiered. UNO’s Virtual Music Week will be an annual event. Long-range projects include establishing A.M.I. as the resident ensemble of PKI’s Second Life Performing Arts Concert Hall, collaboration with the Heartland Philharmonic, and a realization of Stockhausen’s *Helicopter* String Quartet.

### 5. SUMMARY

It is through collaboration and the sharing of resources that allowed UNO to create new and innovative course and degree offerings that incorporate Music Technology and the first-rate facilities to implement creativity. The partnership has allowed students and faculty in the College of Communication, Fine Arts, and Music and the College of Information Technology to meet the demands of the changing landscape of Music Technology and Information Technology. Despite its geographical isolation relative to the more historically established centers of Music Technology on the coasts, the University of Nebraska at Omaha used collaborative ideas and implementations in order to establish its foothold in the arena of Music Technology. It is UNO’s endeavor that this synergetic effort can be looked upon as a model for other institutions facing the same challenges.

*Figure 2. Peter Kiewit Institute (PKI), home of the Department of Information Systems and Quantitative Analysis of the College of Information Science and Technology (photo - courtesy of DLR Group)*