

COLLABORATIVE AUDIO PRODUCTION


by

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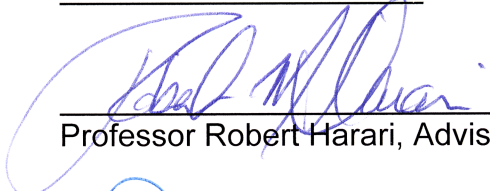
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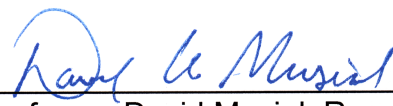


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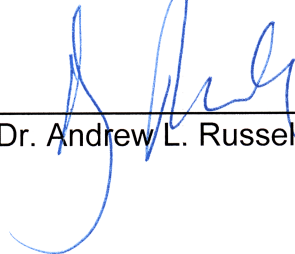
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ABSTRACT

The entertainment industry has experienced productive as well as disruptive changes over the past decade due to the Internet's increasing popularity and connection speeds. As profitability decreases due to consumers' increasing expectations that digital content should be free, production costs must be lowered for high quality to be maintained. In an effort to maintain the quality that consumers expect, can the recent abundance of personal recording studios be used to manage costs in professional media production? The decreasing costs of owning a personal studio, combined with the increasing number of people being educated in audio production, has created an industry saturated with young, willing individuals who can provide major media companies with the skilled labor necessary to maintain high standards of quality. Producers of film, television, music, or any other professional content could outsource tasks to upcoming audio engineers for a better value compared with owning or renting large, costly, commercial facilities, but so far, nothing enables such a model to work efficiently. This thesis proposes the requirements of such a mechanism for expanding the possibilities of collaborative audio production and how it could be implemented as an online application and community.

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LIST OF ABBREVIATIONS

DAW	Digital audio workstation
dB	Decibel
FLAC	Free Lossless Audio Codec
FTP	File Transfer Protocol
GUI	Graphical user interface
HD	High definition
ICT	Internet and communication technology
ISP	Internet service provider
kHz	Kilohertz
LED	Light-emitting diode
MIDI	Musical Instrument Digital Interface
MMORPG	Massively multiplayer online role-playing game
MP3	Motion Picture Experts Group Layer-3 codec
NDA	Nondisclosure agreement
UGC	User-generated content
XLR	Cannon X-series connector with latch and rubber compound

1. INTRODUCTION

Recording studios have welcomed incredible changes in audio technology throughout the past few decades. However, disruptions in the music industry's sales models have created a situation where budgets may no longer support using the large, commercial studios of yesteryear. Instead, personal studios, often located in the homes of their owners, are the facilities more often used today for many aspects of music production in all but the most elite projects. Postproduction, which consists of the "sweetening" processes that follow initial content creation, is especially likely to occur in personal studios. Quality differences between professional and semi-professional equipment can be an issue, but computer emulations of expensive hardware have closed some of the gaps.

Advancements in Web technologies have created an Internet-based social scene. In the past, site owners authored Web content, but now some sites allow the entire user base to have a hand in the creation of what others will ultimately view. Users then leave comments stating what they like or dislike, and this occurs for professional news articles, amateur blog posts, photos, videos, music, and any other digital publications.

The notion of outsourcing content creation to the crowd of users is known as "crowdsourcing," and the work that goes into audio production might be able to be similarly crowdsourced. By harnessing the abilities of audio engineers around the world, regardless of whether they are formally educated or self-

taught, there is the potential for production to be distributed in a collaborative manner rather than centralized within a single studio.

In establishing a network of personal studios to compete with commercial studios, the designer must take care to ensure that the emotional elements of the music are not lost. Human interaction is the basis of music and recorded sound, so replacing real-world activities with their virtual counterparts is a potentially risky endeavor. Virtual worlds, such as Linden Lab's *Second Life*, take computer-based social activities and cast them into a replica of real life, creating a "virtual reality" that leaves the original form of Internet communication, the written word, far behind.

Classified advertisements are a practical way for content producers to have audio production work performed in personal studios at rates far below what commercial studios would charge. Students and professional freelancers that work from home can perform the necessary tasks, but since the leading advertisement websites do not specialize in audio, crucial functionality, such as a secure payment method or the ability to profile users and assess compatibility, is often unavailable. As a result, they are better at establishing offline, face-to-face meetings than conducting entirely online transactions.

In this thesis, I thoroughly address all of the aforementioned topics and propose technological innovations that would make collaborative audio production over the Internet a viable alternative to professional services. Concerns range from computer file size and broadband connection speeds to the

lower fidelity offered by consumer equipment as compared to professional equipment. Solutions include the utilization of large numbers of playback systems as a quality control to determine how recordings will sound in a variety of acoustic environments, as well as the reputation mechanisms necessary for assessing which users are best qualified for particular jobs. The result is a culmination of the Web's latest utilities and trends as applied to the field of audio production.

2. THE PERSONAL STUDIO

Creating a personal recording studio has become an activity that many people can afford. The price of personal computers has been declining while processing power has been increasing. Companies like M-Audio and Behringer provide discounted recording gear, and the online auction website eBay provides a high level of financial liquidity so that any purchase can be reversed on a whim. Most importantly, the Internet enables the enthusiast to learn virtually everything necessary to build a studio, especially when online forum users freely extend their wisdom in a manner vaguely reminiscent of the traditional peer-mentor relationship.

Throughout this thesis, I will use the phrase “personal studio” to refer to what is commonly also known as a project studio, home studio, bedroom studio, basement studio, or whatever else its owner might decide to call it. The intent is to encompass all possible variations of the small, usually residential recording studio that is not likely to be published in the Yellow Pages as a registered business. Certainly, the owners or employees of commercial recording studios could also decide to use their facilities in the ways presented here; furthermore, private studios might even be located in a nonresidential area: these are why the de facto standard of “home studio” is not the phrase I use.

2.1. The Computer

The cornerstone of almost all recording studios today is the personal computer. Software duplicates the functionality of nearly every piece of recording gear in existence, and it is often less expensive or even free. As a bonus, the amount of cabling is inherently reduced (Hawkins 5).

One of the most important concepts in the world of studio software is the plug-in model. Plug-ins are programs that do not run on their own, but instead rely on a host program to insert them in a manner analogous to connecting outboard audio processing gear to a mixer's insert point. Once inserted, plug-ins intercept a particular stream of audio and modify it with standard (or experimental and nonstandard) processes such as equalization, compression, reverb, or any number of other effects. They can also represent virtual instruments, such as synthesizers that can be controlled by external MIDI instruments or recorded MIDI data (Hawkins 10-11). Critics originally found plug-ins to be a novel idea but less impressive than real gear in terms of quality. As processing power increased while processing algorithms improved simultaneously, even professional engineers began to embrace plug-ins. Their use in the making of hit records is proof.

The technology that has been implemented in the world of personal studios was originally developed for large commercial studios. Pro Tools, the industry-standard multi-track recording software, has largely replaced tape machines and other non-computer devices. Avid Technology, the maker of Pro

Tools, has created a tiered offering where the flagship HD version (or its predecessors, TDM and MIX) is most appropriate for commercial studios with larger budgets, and the LE and M-Powered versions are geared toward home users and hobbyists. Other examples of similar software packages are Cakewalk, Sonar, Logic, Cubase, Nuendo, Digital Performer, Audacity, and Garage Band, and collectively these are all known as digital audio workstations, or DAWs (Bartlett 44).

Kevin Hilton, a writer on emerging digital audio technologies, compares the personal studio trend in music production with the same in film postproduction:

While there are now fewer high-end audio facilities than before, there has been a proliferation of companies in the middle to lower end of the market. This parallels what has happened in the music-recording sector, where there are now only a small number of high-end studios and a considerable amount of home-based facilities, generally known as project studios. Such facilities have been made possible by the continuing development of such non-linear editing and mixing systems as Digidesign [now Avid] Pro Tools and low cost digital mixing consoles and control desks. As this technology has been proven reliable for post-production, so project studios have become established in that sector as well. (Hilton 19).

The non-linear editing capability of audio software reduces the need for specialized equipment and the knowledge required to use it properly. When analog tape had to be edited with razor blades and splicing blocks, there was no “undo” function and each edit took far longer to execute. Computer-based facilities have changed this by making editing faster, easier, and non-destructive. There is even the ability, albeit somewhat limited in usefulness, to perform edits on a computer using only a graphical representation of the audio waveform. This is just a microcosm of the changes in workflow that digital audio workstations offer in place of their analog predecessors.

Many personal studios extend beyond a computer in a single room. Nashville engineer Mike Odmark described his studio configuration in an interview with *TapeOp* magazine: “I have an extra bedroom that I use for tracking, but the whole house is basically a tracking room. I have lines going everywhere, a piano in the dining room and random keyboards and organs everywhere” (Reyes-Kulkarni 22). This represents one of the many ways that personal studio owners manage to improvise and adapt to the spaces they have available.

Phil Ward wrote about the trend of personal studios in *Sound On Sound* magazine as far back as June 2002:

The huge studios, if not quite heading the way of the dinosaurs (there’ll always be a role for recording spaces the size of tennis courts, and mixers that could do with a Burger King at the halfway

point), have long been under threat from small-scale recording spaces and control rooms (Ward 127).

“The growth of home recording is a convergence of technology, thrift and shifting musical tastes” and a result has been real studios “dropping like flies” (Pareles 1). The strong do-it-yourself ethic keeps costs down for personal studios, whereas commercial studios may not be able to cut corners as places of business and employment.

3. WEB 2.0 & SOCIAL MEDIA

The World Wide Web is a constantly evolving system. When its inventor, Tim Berners-Lee, created the first Web server and client in 1990, he created a platform on which a person or company could publish information that would be visible to the rest of the world. By the time it entered mainstream society in the late 1990s, there was the occasional catalog-style shopping website, parcels could be tracked as they flew across the country, and one could find numerous other interactive curiosities. But for the most part, it was a one-way street wherein the only user input would be deciding what link to click on next. There were certainly parts of the greater Internet that were more interactive by requiring thoughtful input from the user, but these would run on other protocols such as email and newsgroups and not so much on the hypertext Web.

3.1. Crowd Critique

Technology always seems to follow an exponential rate of advancement, and the Web is no exception. As software developers continuously enhance the capabilities of Web browsers and pages, Web developers increasingly replace static pages with more interactive versions that allow random associations with other users. The term “Web 2.0” has come into use to refer to the generation of websites, acting more like applications, that provide ways for their communities of users to build off each other and have those contributions actually become a major part of the content (O’Reilly 1).

A simple example of this is the “Comments” section found under virtually every online news article and blog entry. Instead of quietly chuckling to oneself, or shouting at the screen in disapproval of either the event or the reporting (where only the members of your household might know of your reaction), every subsequent reader of the article can read every previous comment.

At first glance, allowing for user comments might not seem like a big deal. In fact, a quick look at some of the inappropriately immature comments can promptly turn a reader off to the idea of user commentary entirely. What is less obvious is that this represents a huge revolution in the way people consume media. Instead of one author preaching to many readers, the “many” suddenly gain a voice with their newfound ability to publicize alternative views and ensure that counterpoints are represented. Readers note factual errors so misinformation is promptly suppressed, and typographical errors can also be corrected more quickly. The comments section is also a primary source of reader feedback that provides suggestions for the author to improve any future writing—or, at the very least, make it more popular.

YouTube - Logic Studio 9 ta... x

http://www.youtube.com/watch?v=tuwCstZHmaQ

YouTube

Logic Studio 9 tape simulation trick

audiostudioDOTorg 7 videos Subscribe

ScreenFlow File Edit Insert Font Actions View Window Help

0:02 / 0:57 480p

audiostudioDOTorg — August 14, 2009 — Logic studio 9 tape delay plug in trick that allows for analog sounding tape distortion 13,262 views

Like Save to Share Embed

Post a comment

username I hate people who downloads Logic Pro for free from the internet!

username great tip..thank you :)

username check out our music! were getting logic soon. were totally stoked!

username This works better then any other tube plug in out. You are a GENIUS. THx

username got it free on the internet but i cant install it cuz it keeps asking for serial number , i dont knoe wot to do , can u help me please ? thanks

username Yeah, BUY IT!

username Never seen that trick b4. That is way cool dud

username Nice one, sounds really good if you compare the original with the distorted one.. Maybe a tip to switch the bypass on and off a couple of times at the end of a vid but still great tip!

username This has been flagged as spam show

username nice

1 2 Next

Figure 1: Comments following a DAW technique demonstration
Source: "Logic Studio 9 Tape Simulation Trick" (usernames removed)

3.2. User Generated Content

In addition to comments, the Web 2.0 atmosphere invites end-users to become the providers of a website's primary content. Blogs (short for Web logs, or online journals), YouTube (a video sharing website), and Facebook (a social networking website) have all successfully turned users, previously considered a passive audience, into active contributors. The acronym UGC, which stands for User Generated Content, became popular in 2005. It is used "to describe the various forms of media content that are publicly available and created by end-users" (Kaplan).

According to Harvard University Nieman Fellow and *Wired* magazine contributing editor Jeff Howe, "Crowdsourcing is the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call. ... [It is] the application of Open Source principles to fields outside of software" (Howe, *Crowdsourcing*). The doors are wide open for people who will never knowingly meet in real life to come together and create media. Since there is generally no financial compensation for the users' efforts, these activities can be thought of as hobbies. As such, the level of professionalism is held to no standard whatsoever, except for that desired by those who use the "Comments" section below the primary UGC. In the case of YouTube, viewers have the ability to rate submitted videos with up to five stars. Unfortunately, this is only a measure of overall satisfaction and does not differentiate between the storyline,

acting talent, production quality, and so forth, so more options would make the rating process more useful.

In addition to the YouTube model where all submissions are retained and used, there is a more specialized type of crowdsourcing where a central authority reviews each submission to filter out the bad from the good. This is especially popular in the graphic design community, and websites like crowdSpring.com and 99designs.com allow commissioners to pay a cash prize to the chosen winner. It results in professional-looking work at a sub-professional price point. For creative artists and writers, working “on spec,” or speculation about whether any compensation will be received, has always existed in various forms of notoriety; the Web 2.0 with its enormous community of users just makes it far easier to find those individuals willing to work “on spec” (Howe, “Is Crowdsourcing Evil?”).

4. PRO VERSUS SEMI-PRO

The Web now serves as a platform for anyone to share their music and videos with the world due to new websites and ever-increasing broadband connection speeds, but the heart of home content creation is the consumer electronics market. Many industries have both large equipment for professional establishments and cheaper, aesthetically pleasing counterparts for the domestic market. Sound recording is no different. Before computer-based recording, commercial studios had enormous 24-track tape machines and racks full of processing equipment, while a home enthusiast might have a four- or eight-track machine with rudimentary processing abilities, if any.

Computer recording has changed this immensely. In the early 1980s, home computers were not as ubiquitous as they now are, but purchasing one would easily be within the capabilities of a serious musician looking to pursue recording. Suddenly, the same (or very similar) software was running in both personal studios and commercial studios, creating a convergence between professional and consumer workflow and compatibility.

Despite all the tracking and processing capabilities that computer software has brought to personal studios, there are other elements that contribute to state-of-the-art recording which cannot be duplicated in a price range that is comfortable for home users. Critical listening environments require special attention to detail concerning room acoustics, monitor speakers, microphones, analog-to-digital and digital-to-analog converters, and electrical design with

systematic ground isolation, to name a few. To achieve the best results, commercial methods would have to be pursued and that is usually an unrealistic prospect. Instead, the industry has created a low-end market known as “semi-pro” or “prosumer.” Certain manufacturers are notorious for their inferior semi-pro offerings, but consumers looking in retail stores might not know of any alternatives.

Personal studio owners often overlook creating an acoustically appropriate space in which to record, or it is not considered important enough to justify the costs of design and construction. The semi-pro offering is a foam product that is glued to walls, doors, or any other flat, acoustically reflective surfaces in the studio. The fact that it is rarely—if ever—seen in commercial studios should be an indicator of its lack of usefulness. Unfortunately, the knowledge that acoustic treatment is useful leads personal studio owners to search for reasonably priced solutions, and this product is heavily marketed toward exactly those people. Does it work? The problem is that it seems to work. The foam will absorb sounds in the middle to high range of audible frequencies because it is approximately two inches thick. Since some instruments as well as the most present part of the human voice are right in this range, a demonstration can easily convince listeners that it works. The problem is that lower frequencies remain unaffected, so the result is a “boomier” sound—definitely an unwanted side effect that can diminish the quality of the recording as well as playback. A more proper solution found in commercial studios is to use custom-made baffles containing six inches

of high-density fiberglass for full-frequency absorption, but pre-fabricated products of this caliber are not as widely available as foam.

Good speakers, also known as audio monitors, are another important element that many personal studios lack. Professional studios will often have large, extremely accurate speakers mounted in soffits, which eliminate boundary interactions by harnessing the “infinite baffle” phenomenon. The idea is that recessed speakers have no boundaries to the rear or sides. This type of installation eliminates the multipath reflections and low frequency buildup that boundaries cause. Upon walking into the nearest musical equipment chain store, one will find a room full of tiny near-field monitors (which can be useful in appropriate situations) in the “Pro Audio” department. Surely, they must be of professional quality if they are in “Pro Audio.” Unfortunately, many of them are not up to par, no matter how flat of a frequency response the salesperson claims they have. They will have value-added features that are perfect for interfacing with professional equipment, such as balanced inputs on XLR connectors, or perhaps digital-to-analog converters built in, but that does not make them great speakers. Even bookshelf or living room speakers have the potential to be sonically superior at a lower price, despite often being disregarded as “hi-fi” consumer equipment rather than professional (Ward 126).

The effects of poor speaker quality are quite different from those of other recording studio hardware. They are not part of the signal path that is actually recorded, and therefore they do not affect the fidelity of the recorded sound.

Instead, their impact is indirect: appropriate monitoring facilitates appropriate decision-making. The recording engineer needs to hear everything as accurately as possible in order to know whether the end product will sound pleasing and to avoid problems down the road. The mastering process follows mixing, and it involves preparing the mix for its final medium (e.g., compact disc, vinyl record, tape, computer audio file, etc.) as well as standardizing the spectral balance of the recorded frequencies (Huber 19). Without adequate monitoring during the mixing phase, mastering can become exceedingly difficult and some acoustic artifacts, such as distortion, can be irreparable.

So, what does all of this mean? Audiophiles with “golden ears” will hear the difference. Kids listening on tiny headphones just need to hear something catchy, regardless of sonic quality, in order to like it. The lack of fidelity resulting from extensive use of semi-pro equipment may not be very noticeable, especially as technology improves and falling prices bring better equipment within reach. If the vast majority of listeners cannot tell the difference, it can be argued that the cost savings are worth it. It is widely known among audio engineers that the gear is much less important than the person using it is. With a good ear, and perhaps some good speakers too, recording engineers can find ways to negotiate the limitations of semi-pro equipment with some level of success.

The sound quality debate includes not just engineers and consumers, but also the musicians whose art is actually constrained by equipment quality. Brian

Hiatt, associate editor and staff writer for *Rolling Stone* magazine, uses musician T Bone Burnett's Code project as an example:

Burnett has started a new venture called Code, which aims to do for music what THX did for movie-theater sound: set standards that ensure the best possible quality. The first Code album, John Mellencamp's *Life, Death, Love and Freedom* (which Burnett produced), will be released July 15th [2008] in a two-disc package: a standard CD and an audio-only DVD with superior sound quality that will play on any standard DVD player. The package will also include iPod-playable AAC files ripped straight from the masters, which Burnett says results in better sound (Hiatt).

The existence of efforts like Code demonstrate that some recording artists are unimpressed with the quality of not only MP3s, but even compact discs, which were considered to be state-of-the-art not long ago. Even if people are going to listen on iPods, at least now they are more likely to be playing audio files mastered specifically for that medium.

5. TODAY'S "AUDIO ENGINEERS" AND "PRODUCERS"

"People don't choose a career in audio and music recording. It chooses them" (*Conservatory of Recording Arts & Sciences*). It is the natural pairing of electronics with music for many people. As electronics became ubiquitous, especially in the form of personal computers, the set of people interested in electronics started to intersect with the set of music lovers.

Those who consider themselves audio engineers or producers typically choose one of several educational paths, or some combination of all available options. Autodidacts, who are those that prefer to learn particular skills independently, would traditionally patronize a library to find books on the topic of interest; today, the Web has replaced that activity to some extent because the information is easily searchable and increasingly more abundant. Formal education, including vocational schools and accredited universities, is a standard option that prepares individuals for the workforce quite well. Attending certification courses is also a means of mastering certain tools necessary to produce audio.

5.1. Autodidacticism

With the help of the Web, autodidacticism has become a way of life for many people in many different fields. Through resources such as Wikipedia, forum communities, video tutorials, blogs, and other types of websites, anyone can learn a great deal about any subject of interest in a way that is far more

engaging than most types of formal education. Surfing the Web can be quite addicting, regardless of whether it is for fun or self-improvement. Mitch Joel, president of Canadian digital marketing and communications agency Twist Image, describes his experience with Internet-based education in his “Six Pixels of Separation” blog:

I realized that the Internet, for me, was not about connecting and it was not about content. It was about education. What a powerful tool. Way more powerful than a wall of degrees (for me). From things to read, see, hear and experience. It is a living library of thought and passion, and I am so grateful for the rich wealth of knowledge and sharing that takes place at a macro and meta level - at all times (Joel).

Audio recording techniques and theories emerged from their rather selective crowd into something that many more people have adopted. Along with free information on the Web, free, cheap, or (unfortunately) pirated recording and sequencing software made the necessary tools available for all of these people to familiarize themselves with the recording process. As a result, people with extremely limited qualifications and life experience came to the unprecedented conclusion that they might declare themselves “audio engineers” and “producers.”

5.2. Formal Education

In recent years, there has been an explosion of institutions offering programs in audio engineering. Some of the most well known schools currently are Full Sail University, the Institute of Audio Research, the Conservatory of Recording Arts and Sciences, and the SAE Institute (formerly the School of Audio Engineering). The SAE Institute even has locations worldwide, with facilities in 58 cities (“Locations”). Despite the currently saturated market of young audio engineers, schools like Musicians Institute in Hollywood, California are continuing to expand their offerings:

Musicians Institute (MI) is pleased to announce the Live Sound Production Program joining its renowned Audio Engineering Curriculum, beginning the summer quarter of 2010.

Students working towards a certificate in Audio Engineering (Live Sound Production) will have a curriculum that combines two quarters of comprehensive training in audio recording and production with an additional quarter of intensive, hands-on study in all aspects of audio production for live events from clubs to large concerts. ... The complete program is three quarters long and students earn 45 credit units (“Musicians Institute Adds Live Sound Production Program to Its Audio Engineering Curriculum Beginning Summer 2010”).

These vocational and trade schools can hone an audio engineer's skills in specific areas, but they do not necessarily provide a well-rounded education. Traditional degree programs such as a Bachelor of Arts in Music & Technology, a Bachelor of Music in Performance, and a Bachelor of Science in Electrical Engineering are academic paths of higher learning that aspiring audio engineers can pursue. Stevens Institute of Technology implements a program it calls Technogenesis®, which strongly encourages an entrepreneurial mindset over the simpler technician occupations. Regardless of major, students are encouraged to be entrepreneurs as Stevens “recognizes the new role that universities are adopting in response to pressures—both internal and external—to create wealth through the exploitation of scientific discoveries and technological innovations” (“Academic Entrepreneurship”). This, complementing a curriculum that also strongly emphasizes the importance of classical humanities, is in stark contrast to the direction offered by vocational schools.

5.3. Certifications

As either an alternate or a supplement to a regular education format, certification processes provide another method of establishing a foundation in audio that others will recognize. The industry-standard recording software such certifications:

Pro Tools Certification is arguably the most comprehensive method of learning Digidesign's Pro Tools software. Prospective students

enroll in a series of courses with the end goal in mind of becoming a Certified Pro Tools Operator, Expert, or Icon Mixer for the latest version of the Pro Tools software (Worbeck).

These courses are taught at schools like those mentioned previously, and the certifications alone can cost between \$3000 for a basic version and over \$6000 for a “Post Production Expert Certificate.” These will fill out a résumé nicely, but do not guarantee anything. Other forms of “hands-on experience with Pro Tools combined with online research, tutorial DVDs, and interaction with audio engineering professionals can lead to a high level of skill with the software,” so depending on the particular student, “Pro Tools Certification could be a wise investment or a big waste of time and money” (Worbeck).

6. WORK

The number of college graduates with audio degrees, people browsing the Pro Audio departments of national chain stores, people on Internet forums looking for help with equipment, and those aforementioned “engineers” and “producers” are all indicators that personal studios are increasingly common. A typical studio owner may record his own band, and then several friends’ bands, and even pass around business cards in hopes that a return on his or her investment will come sooner rather than later.

Musicians who discover the availability of semi-pro equipment at the local music store, but who do not anticipate a career dedicated to audio engineering, represent another subset of personal studio owners. Whether they are solo artists or band members, more and more musicians are trying to make recordings with their own gear as time goes on. Ultimately, the result is that many studios do not have as much work as they used to. Even orators (such as today’s “podcasters”) looking for high quality recordings of their own voices might invest in semi-pro gear to create a miniature studio rather than patronizing an existing studio, further exacerbating the issue. All of these sources of work for studios are rapidly diminishing as consumers discover semi-pro, which happens to be approaching a quality widely perceived as flawless.

Yet another subset of personal studios is entirely unsuitable for all but the most casual meetings. Roommates, children, or any other distractions, which are common in residential settings, can discourage professional clients or make work

nearly impossible. The owner might be an overly introverted computer enthusiast who figured out how to use recording software and became quite proficient at it, or it could even be an underage person whose parents are not comfortable with business being conducted in their house. Certain neighborhoods may have zoning regulations that prevent anything except personal use. Whatever the reason may be, these studios, if they may even be called studios, are sources of substantial processing power that represent lost productivity if they are not used to their full capacity in a work-from-home manner.

If a channel existed that could deliver more work to this swarm of personal studios in a simple yet highly effective manner, it would fill the void. Among the vast sea of personal studio owners, there are going to be some who really know their craft and devote a sizable amount of their time to improving their skills, even if they are mainly computer-based skills. They may choose a traditional education or perhaps go right to work with internships, but once they are hooked, they pursue it. Regardless, audio students need some side jobs or entry-level work out of college, and finding ways to collaborate on projects for well-known people is frequently a sought-after path. With Web 2.0 communities encouraging everyone to be a part of the content delivered to the masses, it is not only self-proclaimed “sound guys” who might want to do this, but also a whole crowd of enthusiasts with an urge to contribute.

Rather than directly building or renting costly facilities and staffing them, this crowd can do the work. It would be similar to contracting work out to

freelancers. The issue facing traditional freelancers is that geographic location is a limiting factor that determines which opportunities can be pursued. Significant travel is usually out of the question unless the job is enormous because overhead costs would be prohibitively high. Instead, the very nature of digital audio means that it can be transferred anywhere via the Internet in an incredibly short amount of time. Now that broadband connection speeds finally allow quick transfers at seriously high quality (even without lossy perceptual coding such as MP3), production companies have the opportunity to match the work to the workers without anybody even leaving their chairs. The implications of replacing face-to-face activities with information and communication technology (ICT) represent an engaging topic on their own, but in the meantime, there is no reason for audio production to be left out of the loop.

When location is no longer a prohibiting factor in a group's ability to work together, the market can be globalized. As with all industries, globalization can quickly turn a market upside down and wreck existing business models. In a prosperous country known for outsourcing work to areas with lower wages, the value of domestic freelancers' skills decreasing is a real side effect for which to watch out. Most of today's audio work does not transact through these channels of ICT, instead relying on traditional business networking with real exchange of business cards. If a mechanism were in place on the Web that could maintain the responsibilities of the "real world" and keep quality standards high by statistically assessing each worker's abilities, the previously mentioned crowd could end up

with more work than it can handle, maintaining a ratio of supply and demand that is still in favor of the workers.

7. REMOVING THE HUMAN INTERACTION

Experienced recording engineers know that one of the most important aspects of every session is the “vibe.” When musicians, voice-over actors, or any other types of clients are in the very strange and intimidating world known as a recording studio, creating a comfortable setting is crucial to capturing the best possible performance. The communication happening between the artists and the studio staff—real people all in close proximity—determines whether the day will be a success or a failure (Summers 112).

Music is a highly social phenomenon, and many aspects of its creation rely on these human interactions. For this reason, traditional recording facilities must remain in their existing form for the initial work of capturing ensembles in which musicians challenge each other in simultaneous performance. Supersonic frequencies (above 20,000 Hertz) can even affect humans psychoacoustically, despite being above the upper limit of human hearing. The effects are emotional, and often incite aggravation when the overtones are especially harsh and distorted. Conversely, pleasant sounds can inspire relaxation and contentment in ways that enhance the quality of the session (Sonnenschein 71).

Following the initial group recording session, there is so much work to be done before a recording becomes a product, including editing, processing, mixing, and mastering. For film or video projects, an enormous amount of fine-tuning is usually required to allow audio captured in different environments to mesh without jarring transitions. Engineers often use pitch correction, rhythmic

correction, and equalization with a single goal in mind: to fix and sweeten a sloppy recording so that it will sound better to anyone's ears. All of these processes generally are removed from the original performance session, and the engineer can accomplish them in a very solitary environment. The emotions are already on the tape, and the way in which the subsequent work is accomplished—such as distributing it via the Internet without compromising audio quality—cannot take that away. Overproduction certainly can ruin the “vibe,” but modifications made in ways that are sensitive to it can happen anywhere.

On the other hand, some particular aspects of music recording do not require such an atmosphere. Electronic music produced with sequencers and samplers can be programmed without a traditional live performance. Even the more traditional types of music often make use of overdubbing after the initial tracking session in the studio is complete. Overdubbing is the process by which incorrectly performed elements are re-recorded without the other musicians (who performed correctly) playing along. All of the original takes are kept except for what was overdubbed (Huber 27). These instances of recording which do not depend on live interaction can easily happen in remote locations through online communities, just like the aforementioned postproduction engineering.

Overdubbing is not limited to replacing elements that were recorded in the initial group session. Rather, a rhythm section consisting of drums and perhaps piano and bass can lay down those rhythmic parts, and that will fully establish

any musical fluctuations in tempo in preparation for other instruments and voices to be overdubbed later. Recording this type of performance, unlike a complete ensemble performance, does avail itself to the geographically separated collaboration that the Internet helps to facilitate.

8. VIRTUAL WORLDS

Recording studios are brick-and-mortar facilities, but the activities that take place inside them are increasingly digital and computer-based. Cloud computing represents the notion that individual computers do not need to perform tasks on their own, but instead a server farm can perform tasks in a central location as users anywhere in the world log in to execute them. This chapter examines the viability of cloud computing applied to audio production, specifically through the lens of a virtual world, *Second Life*, because it supports the types of relationships necessary for humanlike interaction.

8.1. Second Life

In addition to the largely textual nature of the Web and email, there are services on the Internet that employ elements of human interaction far beyond the written word. Applications such as Linden Lab's *Second Life* attempt to emulate real-life encounters by employing three-dimensional worlds that are very similar to massively multiplayer online role-playing games (MMORPGs). Within these worlds, the users are represented by customizable avatars that can walk, talk, and do business. Unlike fantasy games such as first-person shooters, where the characters' skills and objectives are highly removed from the real world, activities in *Second Life* are far more closely aligned with reality. The experience can hardly be considered a game.

This very recent (2010) account of a law firm using *Second Life* exemplifies the viability of conducting business in a virtual online world:

Since 2003, *Second Life* has been a marketing test ground for brands such as Coca-Cola, Adidas, and Sears. IBM operates a complex of in-world islands dedicated to employee recruitment, business meetings and training seminars. And now it's [law firm] Jones Walker's newest frontier.

"We wanted to get into a business community there and see what the opportunities were," [chief marketing officer Carol Todd] Thomas said.

To be clear, the Jones Walker *Second Life* office doesn't practice law in the virtual world. Rather, Thomas uses the office as a common meeting and training space for the 11 Jones Walker offices spread from Arizona to Washington, D.C. (Larino).

Unlike traditional conference calls or email chains, coworkers on opposite sides of the world can conduct meetings all in the same "room," without travel expenses. Additionally, their virtual presence advertises Jones Walker's real-life services to the millions of online residents who happen to see the office (Larino).

Academia has discovered a use for the program just as the private sector has done:

Virtual environments are the next logical step for educational institutions already experimenting with online courses and video

conferencing, [Merrill] Johnson, [senior associate vice chancellor of academic affairs at the University of New Orleans] said.

UNO offers several courses on its virtual campus and Johnson said students increasingly are attracted to the personal classroom interaction *Second Life* offers without the geographical tether real-life imposes, though living through an on-screen digital doppelganger takes some getting used to (Larino).

Second Life activities are subject to the abilities Linden Lab has provided for the world and its residents. These include the ability to talk with other residents in the vicinity through a push-to-talk mechanism, sell virtual items that the resident designed by hand, and drive vehicles from one place to another, among many others. These limitations have not stopped business from flourishing:

Last year [2009], as the physical economy withered, *Second Life's* economy blossomed, with user-to-user transactions topping \$567 million in actual U.S. currency, a 65 percent jump over 2008. About 770,000 unique users made repeat visits to *Second Life* in December [of 2009], and the users, known as residents, cashed out \$55 million of their *Second Life* earnings last year, transferring that money to PayPal accounts (Rosenwald).

Business through virtual worlds is as serious as business through any other online means, except that there is an option to provide products and services which are either real or virtual.

As part of my research, I decided to perform a Google search with “second life recording studio” as the query. The first result was located on world.secondlife.com, and it was a page describing a recording studio in the virtual world, including the entire inventory and an image of the control room (see figure 2). From there, a link encouraged me to create an account on *Second Life*. After I had completed the registration process and installed the software, I found my avatar standing right inside the studio (quite auto-magically) with three other residents who were discussing their singing abilities. I quickly discovered the push-to-talk function that creates a party line type of audio connection with those around you, complete with stereophonic panning to localize each individual voice, and I jumped right into the conversation.

The studio owner, a five-month *Second Life* user who lives in Florida in real life, was highly interested in my audio background and considered hiring me to record the live performances he was involved with at virtual venues. I indicated that it sounded like a wonderful opportunity, while thinking to myself that I barely had enough time for real life. He gave me a virtual copy of his CD, and all three of my acquaintances provided an amazing amount of help and advice to this newcomer. From the mere hour or two I spent with these people, I was amazed

by the fact that these communities and opportunities exist since they are invisible to those who have not discovered them.



Figure 2: Advertisement for a recording studio in *Second Life*
Source: "Second Life Places"

8.2. Virtual Recording Studios

The recording studio I landed in was not functional. Instead, it was merely a visual piece of artwork like any other building, but with a control room that contained objects *resembling* industry-standard equipment such as 19-inch racks, a mixing console, and even an Apple G5 computer tower. *Second Life* does not seem to provide any way for a functioning recording studio to exist, but the idea seems plausible given the capabilities of modern computer software design.

Software representations of recording equipment already exist in the form of DAWs, as mentioned in Chapter 2.1. There is typically a mixer window that

represents a recording console, an edit window that represents a tape machine, and plug-ins that represent pieces of outboard gear. Most DAWs support external control surfaces, which emulate the tactile experience of using the original hardware rather than using a mouse to click through a graphical user interface (GUI). They can have motorized faders (emulating the original Flying Faders system found in large consoles), various knobs that are assignable to virtually any DAW parameter, and an LED display that shows the current position of the recording in either elapsed time or musical measures.

To have a functioning recording studio within a virtual world like *Second Life*, an underlying DAW would see the world as an input device similar to a control surface, and all processing and audio file storage would be located on a central server. Virtual artifacts would represent each variable control found in a studio, from volume faders to tape transport controls. The world's infrastructure would be responsible for passing user actions to the DAW, just as a control surface would, so that all participants may hear changes immediately. Audio routing could include connections not only to physical audio interfaces, but also to plug-ins owned by each participant in the project. Advanced speaker emulation could allow each user's speakers to take on characteristics of any other industry-standard types, if they are of sufficient quality to begin with. To expand on this concept further, binaural headphone modeling or surround-sound processing could allow users to become completely immersed in the recording environment. The system would have to calculate the necessary changes in acoustic

reflections properly, in real time, in accordance with the avatar's position in the room.

Working on a project in a virtual studio in this way would be analogous to the cloud computing solutions that already exist for document sharing and instant text-based communication. In Google Docs, for example, multiple users can simultaneously edit a single document, spreadsheet, or presentation file from their own computers, and changes propagate almost instantaneously. In Google Wave, true real-time propagation is achieved in a chat-like text environment where every user can literally work together to build a single sentence simultaneously. Using this real-time collaboration technology to share DAW control data and audio streams between mixing engineers would be the heart of any type of shared studio, regardless of whether the interface resembles *Second Life* or not.

9. EXISTING PRODUCTS AND SOLUTIONS

In the preceding chapters, I have shown how the Internet can provide a platform for audio work. In fact, it has been happening for years. Email, file transfer protocol (FTP), and Web-based services can move raw audio content just as well as they can move any other computer files. However, there are not yet any solutions specifically created to facilitate collaborative audio production on a grand scale. The following websites do make it possible to some extent, but the process is too cumbersome and requires too much trust for a successful collaboration between people who will never meet each other. Furthermore, existing solutions allow work to be outsourced but not crowdsourced.

9.1. Craigslist.org

One existing solution is Craigslist.org, which is the Web's most well known location for classified advertisements. Craigslist is organized by geographic location and by advertisement type, ranging from items for sale all the way to personal advertisements. There are sections for jobs and gigs, and a quick search yields plenty of requests for work in the field of multimedia production. Figure 3, a screenshot of a typical advertisement, shows an anonymous third party requesting audio production with the work location specified as "Your Studio." After finding a good match for the project, the advertiser would presumably send a 90-second clip of audio to the freelancer via email or some other method of Internet file transfer. Prohibitively large projects (unlike this

example) might even require shipping physical media back and forth if broadband Internet connections of sufficient speeds are not available.

The problem here is that the freelancer is forced to work on speculation that his efforts will be properly rewarded, since the purchaser would not likely send the payment in advance. There is no basis for any sort of trust other than the textual conversation contained in the two parties' email boxes. For a larger project involving a more significant amount of money, a phone call may seem to offer a better sense of trust, but it is all psychological. Craigslist currently offers no mechanism to establish a system of trust because every post is anonymous and unregulated.

When both parties are located in close geographical proximity to each other, this problem can be alleviated by arranging a physical meeting wherein the product is exchanged for cash over a handshake. This activity is not without its own set of vulnerabilities. There is likely to be an inability to examine the work carefully prior to paying for it, unless somebody brings a notebook computer to the meeting. This extends well beyond the context of *online* collaboration and severely cripples one's ability to find the best person in the *world* to do the job (or the cheapest, if that is the goal).

The screenshot shows a web browser window with the following content:

Radio Imaging Needed. x +

← → ↻ ☆ http://newyork.craigslist.org/mnh/crg/1652032470.htn ▶ 📄 🔧

[new york craigslist](#) > [manhattan](#) > [gigs](#) > [creative gigs](#) [email this posting](#) [to a friend](#)

Radio Imaging Needed. (Your Studio.)

Date: 2010-03-19, 6:28PM EDT
Reply to: gigs-rjwgc-1652032470@craigslist.org [Errors when replying to ads?]

I am creating an audio project (:90 in length) that needs a little extra audio oomph (meaning please have your sound effects, Pro Tools game on lock).

I am big on pushing the "current boundaries of sound" found on today's radio.

Genres: UAC, Urban

Interested?

Reach out.

- Location: Your Studio.
- it's NOT ok to contact this poster with services or other commercial interests
- Compensation: PAY is definitely in order. Let's talk first.

PostingID: 1652032470

Copyright © 2010 craigslist, inc. [terms of use](#) [privacy policy](#) [feedback forum](#)

On the right side of the page, there is a box with the text: "please [flag](#) with care:" followed by four links: [miscategorized](#), [prohibited](#), [spam/overpost](#), and [best of craigslist](#).

Figure 3: Screenshot of Craigslist advertisement
Source: "Radio Imaging Needed"

9.2. Freelancer.com

A far more sophisticated system can be found at the website Freelancer.com (formerly GetAFreelancer.com). This site is dedicated to matching workers with work that needs to be done, and it organizes different types of work into a huge database of categories. By far, the most popular use of the site is for writing computer software, but many other categories exist, including “Audio Services.” Freelancer.com defines this category as follows:

Audio services may include recording, mixing, or extracting one or more sounds within a single file. This is not easily done by amateurs, and is best left to professionals for clear, high quality sound. For competitive rates, top notch quality, and proven experience, you can't do better than a freelancer. These individuals can complete your project within the budget and timeframe of your choice, and deliver high quality audio every time (“Audio Services Jobs for Freelancers”).

Freelancer tackles the main problem with Craigslist, its lack of a payment mechanism, through having “created a safe environment for both service buyers and service providers via our secure payment system.” In a manner similar to that used by professional contractors, freelancers can bid on projects so that the wage is fairly determined by the market (although the opportunity to arbitrage the global market trumps any sense of fairness). Despite having a highly developed financial architecture, a payment issue arises which is far deeper than the

existence or nonexistence of a secure wire. Freelancer.com offers job posters the assurance that it will “outsource the project and [not] release any money until you’re satisfied!” (“Audio Services Jobs for Freelancers”).

At first glance, it seems reasonable that the work must be completed satisfactorily prior to the release of funds. The underlying problem is that workers are at a significant disadvantage if the expectations of the job poster are completely unrealistic and unattainable. Theoretically, the poster could evaluate and reject an infinite number of submissions at absolutely no cost before realizing satisfaction, much like sifting through contest entries of which there will be only one winner.

9.3. Reel-Exchange.com

There are also services that benefit entertainment-producing communities by only sharing information rather than facilitating actual business. One example is Reel-Exchange.com, and it offers the following service:

Reel Exchange is a professional business-to-business community that connects you with other film and video professionals around the country and around the world. Members will find project work and permanent positions, hiring opportunities, and potential collaborators for on-spec projects.

Reel-Exchange hosts demo reels and other types of professional content (trailers, short films, sample commercials, etc.) that

demonstrate professional skill in the various disciplines. Search based on geographic location, discipline, equipment/format, project credits, and more (“Reel-Exchange: About Us”).

Unlike the one-off jobs found on Craigslist.org and Freelancer.com, Reel-Exchange.com is more relationship-oriented. Although it is an online service, it does not directly facilitate online work. In fact, its “geographic location” search filter suggests that it advocates *offline* collaboration. It is more like a glorified industry social event of an infinite duration, which is certainly useful in its own right, rather than a place to do business.

10. PROPOSED SOLUTION AND IMPLEMENTATION

The evolution of personal studios has created a wide market for audio production to be completed on a scale unlike that of just a decade ago, and studio owners are always looking for side work. The results of examining audio-related gigs on Craigslist.org and Freelancer.com indicate that this has already begun, but such sites leave much to be desired in terms of functionality because they are not designed with audio production in mind. This requires a specific solution, and a willing Web developer could turn it into a working business model based on these findings. For the sake of demonstration, I will refer to such a business as a fictional entity called “StudioLink.” The “buyer” is the party seeking to pay for audio services, and the “freelancer” is the party seeking work.

10.1. Smart Classifieds

The usage of StudioLink would encompass the following basic flow. A buyer uploads his raw media to the website and simultaneously allocates compensation money from his already-funded account. Freelancers looking for work then decide to take the job, and the buyer is able to select a freelancer based on profile data. Alternatively, StudioLink could serve as an automated matchmaker based upon compatibility determinations, similar to online dating services like eHarmony. Next, the chosen freelancer is given access to download the raw media and begins working after discussing the specifications. If any of the material is copyrighted, a nondisclosure agreement (NDA) can be

electronically signed first. Upon completion, or at periodic milestones, the freelancer uploads the work to StudioLink for the buyer to listen through a streaming player. The buyer then determines whether the work is satisfactory, which not only breaks or seals the deal, but also builds reputations (more on this later). Finally, the buyer downloads satisfactory work and the freelancer receives a compensation transfer from the buyer's account.

The cornerstone of StudioLink is its reputation system, which consists of a recursive formula based on satisfaction ratios and user feedback. When a buyer considers a freelancer's work to be either satisfactory or unsatisfactory, this is saved in both the freelancer's and the buyer's record. A freelancer with three satisfactorily completed jobs and one rejected job would be said to have a 75% ratio. Likewise, a buyer who has accepted two submissions and rejected two others would be said to have a 50% ratio. However, the necessary recursive component is that rejecting work from a low-ratio freelancer does less harm to a buyer's reputation than rejecting work from a high-ratio freelancer. Thus, there is an incentive to accept the work of freelancers who have proven their abilities and carry an excellent reputation. Inappropriate rejections represent money directly out of a freelancer's pocket in the form of his time, so this system of minimizing such activity is critical. An additional layer heavily weighed into every user's reputation value is simple eBay-style feedback, with comments and ratings for various aspects of the quality of work and the overall experience.

Randy Farmer, an inventor of basic structures for virtual worlds and social software, describes the growth of eBay's feedback system in his book, *Building Web Reputation Systems*, and StudioLink would use a similar model:

eBay contains the Internet's most well-known and studied user reputation or karma system: seller feedback. Its reputation model, like most others that are several years old, is complex and continuously adapting to new business goals, changing regulations, improved understanding of customer needs, and the never-ending need to combat reputation manipulation through abuse (Farmer 78).

One weakness in the system proposed so far is that a user could build fraudulent reputations through multiple accounts, whereby what appear to be separate entities will give perfect comments and ratings about transactions that never actually occur (Farmer 78). There are at least two methods of circumventing this. The first would be limiting account creation by requiring a Social Security number or some other identifiable device, but this could dissuade legitimate users from using the website. Another solution would be to make bogus transactions prohibitively expensive by collecting commissions. This has the unwelcome side effect of prohibiting alternative revenue models such as all-you-can-eat subscriptions or an advertisement-supported system that keeps use of the website completely free.

A second vulnerability is the possibility that a buyer could record the audio from the streaming player in order to circumvent the need to pay the freelancer. A simple solution is to implement a script on the backend Web server that modifies the submitted work into a dedicated “audition file” to be streamed to the buyer while the full original work remains inaccessible. This audition file would be processed in a way that makes the audio useless as an end product while still affording the buyer the ability to make a sound judgment on the quality of the submission. This can be accomplished in a number of ways, selectable by the freelancer, to provide an appropriate layer of protection for the particular work. One simple solution is to eliminate a small section of audio periodically by either skipping over it or overlaying an undesirable noise. In most cases, this form of copy protection renders the audio useless to the buyer, thus forcing the completion of the transaction. The analogous solution in a traditional studio setting is to prohibit clients from taking even rough mixes home until they have paid for the time; until that occurs, they may only listen to their recording within the studio facilities (Andolino).

Comparison of Features and Abilities			
	Craigslist.org	Freelancer.com	“StudioLink”
Allows freelancers to find projects	Yes	Yes	Yes
Ability to give feedback	No	Yes	Yes
Supports payment processing	No	Yes	Yes
Automatic project bidding	No	Yes	Yes
Specializes in audio	No	No	Yes
Supports streaming auditions	No	No	Yes
Automatically generates “crippled” audition files	No	No	Yes
Profiles users based on creative preferences	No	No	Yes
Option to open jobs up to the entire community	No	No	Yes

Table 1: Comparison of Craigslist, Freelancer, and StudioLink
Source: Author’s original work

10.2. User Comments and Suggestions

In addition to organizing contractual work between freelancers and content producers, ideal collaborative environments also enable “crowdsourced” contributions in the manner of other Web 2.0 applications. As discussed in Chapter 3.1, Crowd Critique, online communities often use “comment” systems for group discussion of a particular work. The constant barrage of critical remarks can suggest flaws that the author should correct, encourage similar work in the future, and most importantly, create an atmosphere that demands the best possible effort on not only the author’s part, but also that of other commenters.

Regarding the invitation of contributions on a wide scale, independent filmmaker Michael J. Herbert warns, “The wider the net you cast, the more likely it will be that you’ll end up with junk in your net.” He indicates that most people cannot perform at the level necessary for professional feature productions, which is why the entertainment industry is a lucrative business (Appendix 1). An entire world of users providing their opinions does inevitably have the ability to knock a project off-course, so project coordinators must carefully evaluate all suggestions prior to incorporating them into a large, important work.

This problem really hinges on whether the “crowd” is unregulated and consists of every Web user, or is privatized within a community of audio professionals—the StudioLink user base, for example. Potentially, users with production ideas who want their voices heard could sign up to be part of that project’s community, and the executive producer (or head audio engineer, in the

case of sound production) could choose to approve or deny the request. This model is similar to the way online forums work: users choose in which threads they would like to contribute based on their expertise or interests.

A serious benefit to opening up a recorded work to multiple listeners prior to release is that more flaws will be detected. An analogy in the computer software industry is the beta testing phase that many developers use. The idea is that the testers will run the software on virtually all of the system configurations that paying customers may use following the official release. At the very least, this testing system spans much farther than any in-house testing ever could.

Porting the concept to recorded sound, the various systems consumers employ for playback are likely to be far from the ideal control room found in commercial studios. Questionable speaker qualities, varying acoustic signatures of listening rooms, pseudo-surround-sound spatial processing, and high noise floors are all issues that exist in the real world but should not exist in critical listening environments. Traditionally, a mixing engineer would burn CDs (or make cassette tapes prior to recordable CDs) and play them in the car after the session. Cars are usually sufficient at providing a worst-case scenario with poorly positioned speakers, possibly a receiver employing psychoacoustic processing by SRS Labs, and road noise within 20 dB of the music listening level.

Mixing engineers have various other tricks for this purpose, such as monitoring through a pair of Auratone 5C's:

The Auratone was, and is, little more than a five-inch ‘full-range’ driver screwed into a small cube-shaped enclosure. It had little pretence to audio accuracy or wide bandwidth, and was simply intended to provide a reference for the likely sound of recordings when reproduced on an AM radio, or via a TV. So the Auratone was not really a ‘nearfield’ in the sense that we understand the term now, but it did set a precedent for auxiliary monitors, and prepared the ground for the second nearfield icon—the Yamaha NS-10M (Ward 127).

The technical term is checking for mix translation, and it involves purposely using a low quality system that either is, or closely mimics, the consumer electronic equipment that will ultimately reproduce the recording. Speakers are often the variable of interest because they have the ability to color the sound significantly more than the other equipment in the signal chain. Cheap amplifiers and digital-to-analog converters can also cause issues but generally at a less noticeable level.

Having a community of “beta testers” listening to works in progress has a built-in side effect of constant mix translation checks. In addition to providing creative suggestions and addressing real sonic flaws, the users can give feedback on how the mix sounds on their particular systems with which they are already familiar. If the engineer wants to know how the mix sounds in a car, but lives in a city where owning a car is unnecessary, he can glance at the

commentary given by car owners who have done the work for him. If he suffers from hearing loss due to age or overexposure, the commentary might reveal agitating high frequency sounds that he would have otherwise missed. The engineer has a potentially limitless number of sources at his disposal for these as well as similar purposes. In an environment such as StudioLink, reputation profiles would help users assess the qualifications of others and therefore the value of particular reports.

Computer programmer Eric S. Raymond credits Linus Torvalds, inventor of the Linux operating system, with a philosophy that describes this phenomenon in an open-source software context: “Given a large enough beta-tester and co-developer base, almost every problem will be characterized quickly and the fix obvious to someone. Or, less formally, ‘Given enough eyeballs, all bugs are shallow’” (Raymond 30).

10.3. Sound Quality, File Size, and Bandwidth

Professional digital audio requires large amounts of storage and bandwidth. At the present extreme, audio at a sample rate of 192 kilohertz and a bit depth of 24 bits per sample results in a file size of approximately 33 megabytes per minute per channel. A more common standard, 44.1 kilohertz and 16 bits per sample, results in a file size of about 7.6 megabytes per minute per channel. Stereo audio requires two channels, 5.1-surround sound requires six channels, and multi-track recordings require any number of channels based on

the type of ensemble and the recording methods employed. No matter what, the amount of data adds up very quickly. Solutions to this problem require decision-making that alters a few different aspects of the StudioLink experience.

The best sound quality requires that the audio data be completely recreated in its original form between uploads and downloads, and only lossless codecs can provide significant file size reduction with such a stipulation. A codec, or coder-decoder, is a computer algorithm designed to reduce the file size of digital audio or video content. Lossless codecs operate much like popular file compression utilities such as WinZip or StuffIt: repetitive information is recognized and discarded, while instructions are added that describe how that action may be reversed. FLAC, the Free Lossless Audio Codec, reduces audio files to about 50% of their original size, or approximately 3.8 megabytes per minute per channel for 44.1 kHz / 16-bit audio (Anderton 169).

If users can tolerate a slight degradation of sound quality, lossy codecs may be used. MP3, the Motion Picture Experts Group Layer-3 codec, is among the many lossy codecs that can reduce audio files to between 10% and 20% of their original size without sounding terrible. This is approximately 1.7 megabytes per minute per channel for 44.1 kHz audio: lossily encoded audio does not have a particular bit depth, but the input to the encoder is typically 16-bit.

The main reason that reducing file size is important is that transferring files via the Internet can be a time consuming process. In the United States of America, Internet service providers currently supply customers with connection

speeds averaging approximately five megabits per second. To transfer an uncompressed audio recording project totaling two gigabytes would require approximately one hour on a connection of average speed. A codec that can reduce the file size to 15% will proportionately reduce the amount of transfer time to a mere nine minutes.

Depending on the type of collaboration between the producer and the freelancer, frequent revisions could turn into excessive time spent waiting for transfers to complete. Minimizing this can significantly reduce the level of frustration, but with pristine audio quality sacrificed. A possible workaround is to use lossily compressed files for rough drafts and then perform (hopefully) one final transfer in an uncompressed format.

11. CONCLUSIONS

Over the past decade, people have used the Internet to revolutionize many industries, including communication, shopping, stock market investing, and especially the consumption of music, movies, and television shows. Skype provides free voice communication for which telephone companies charge, so-called “mom and pop” storefronts find it difficult to keep their doors open with online marketplaces Amazon and eBay undercutting their prices, brokerages like Charles Schwab reduce their commissions to match those of discount online platforms, and record stores are nearly extinct due to iTunes. Business models have been turned upside down, leaving those holding on to traditional methods suffering while technological entrepreneurs develop websites that do the same things cheaper, faster, and better. The implications are not only economic, but also social and cultural, and they seem to be increasingly significant in today’s information age.

11.1. Socioeconomic Impact

Commercial recording studios are already being undercut by smaller personal studios, but if collaborative audio production over the Internet were to catch on, they could fare much worse. Their losses could, in theory, be proportional to the growth encountered by entrepreneurs who create the online communities that represent decentralized production networks.

A much more optimistic forecast is that online audio production communities can peacefully coexist with traditional business frameworks. Websites such as MakeLiterature.com, which fosters collaborative writing similarly to Wikipedia but primarily for fiction, satisfy a niche market instead of challenging the mainstream models of their industries. The “About Us” page on MakeLiterature.com describes the site’s model of content creation:

Unlike traditional Literature, where creative writing is secluded (“from the attic/basement”) process, fully subjected to the isolated author’s experience and imagination, we wish to use all advantages of Internet communication channels to provide intelligent collaborative writing environment in which readers and writers meet [sic] together, share their ideas, reviews, experiences and knowledge, and listen to one another all way through the new literature creation process (“About Make Literature Online Project”).

Ironically, it appears as if too many different people had their hands in the construction of that prose, proving that the entire process may still be in its infancy and subject to refinement. Realistically though, the likelihood of persistent errors is dramatically reduced when text is editable by the community rather than a single author.

Any writing that comes from MakeLiterature.com, whether mediocre or extraordinary, is not likely to suppress traditional single-author writing. Without replacing existing workflows, it provides an alternative that merely adds to the

available options when deciding how to write a book. Similarly, the availability of a service like Chapter 10's fictional StudioLink website could complement existing channels, i.e., offline networks of colleagues, and not replace them completely.

To refer back to the discussion of “spec work” presented in Chapter 3.2 and the issues faced in the visual arts—which are quite analogous to the aural arts on many levels—the socioeconomic impact will be a shift in profitability from arts professionals to the entrepreneurs who bring digital crafts to the Internet. Much like the effects of piracy on music and film sales (another consequence of digitization), audio postproduction could become commoditized.

In *Wired* news article “The Rise of Crowdsourcing,” Jeff Howe uses iStockphoto.com, a crowdsourced stock photography website with about 22,000 contributors as of the June 2006 writing, as a convincing example. When National Health Museum project director Claudia Menashe needed particular stock photos on a tight budget, she initially discovered freelance photographer Mark Harmel's collection as a good source. Harmel offered the nonprofit organization his best discount at just \$100 to \$150 per photograph, about 50% off his corporate rate. After weeks of negotiations, Menashe informed Harmel that she had discovered iStockphoto, which licenses photographs at prices on the order of \$1 each—a mere 1% of Harmel's rate, and therefore would not need his services.

For Harmel, the harsh economics lesson was clear: The product Harmel offers is no longer scarce. Professional-grade cameras now cost less than \$1,000. With a computer and a copy of Photoshop, even entry-level enthusiasts can create photographs rivaling those by professionals like Harmel. Add the Internet and powerful search technology, and sharing these images with the world becomes simple (Howe, “The Rise of Crowdsourcing” 1).

His story represents a very drastic change in the economics of freelance work brought about by the digital revolution. Just as with recorded music today, products that were valuable in a physical format, but can now be transferred and copied digitally, are expected to be free. It is a very strange proposition, but it will not be going away and instead must be embraced by Web entrepreneurs. Mark Harmel might not be able to monetize photography, but the owner of iStockphoto.com definitely can.

11.2. Further Considerations

At the risk of sounding apologetic, collaborative production and crowdsourcing can really be applied to all sorts of digital content with a bit of brainstorming on what mechanisms would be necessary. Nearly anything that can be showcased on the Web can have multiple creators, and sound recording is just one example of the fields in which this could succeed.

The current generation of mobile devices, endearingly referred to as “smartphones,” are, fundamentally, tiny computers with an always-on connection to the Internet (and of course, the public switched telephone network). They contain enough functionality to give their owners access to most of the resources that were previously reachable only with personal computers, including the Web 2.0.

Theoretically, Web-enabled mobile devices could serve as input for a system controlling the front-of-house sound systems in concert venues. Many concert sound systems are already digital and operate similarly to DAWs, so the integration procedure mainly lies in a custom software interface that emulates a control surface. Any audio engineers who happen to be in the audience for a show could be granted access to the system on their smartphones, and mixing operations would become an average of what everybody would like to hear. Indeed, limits would have to be in place to prevent disruptions from malicious actions and only enable tasteful changes. As usual, a reputation system would control which engineers receive the privilege of being involved in the largest productions. For the official front-of-house engineer, benefits include the ability to make changes while walking through the house.

There are probably far more useful implementations of these technologies than the prospect immediately preceding, and they will surface as we progress further into our increasingly connected digital age. The advancement of the music industry is at the mercy of digital technology, and fans should be

presented with musical experiences that extend beyond the passive activity of simply listening. I challenge entrepreneurs to devise revolutionary ways of combining music and technology that will rejuvenate not only the recording process, but everyone's collective enjoyment of the art.

APPENDIX 1: INTERVIEW WITH MICHAEL J. HERBERT, FILMMAKER**MF:**

I am investigating the pros and cons of outsourcing audio postproduction to home studio owners through the Internet, which would take away a level of human interaction in exchange for minimizing production costs. A mechanism is proposed wherein freelancers would receive jobs to perform without ever meeting up physically, thus eliminating geographic limitations. Would you find a use for it?

MH:

This is a multi-faceted issue with many pros and cons. There are several obvious reasons why a filmmaker, or anyone looking for an audio engineer, may entertain the option of hiring a freelancer to work on their project. Freelancers often work at reduced rates. Most times, a freelancer isn't tempted to work on higher paying jobs, putting your project on the back burner, because they don't have higher paying projects to work on. Savings on travel, in-person meetings, and rental space is also a great reason to remotely outsource this work.

There are, however, a number of negative aspects to this type of working relationship. The biggest problem, in my mind, is ensuring the quality of the work. Freelancers have no relationship with a larger business presence that can offer assurances that your needs will be met. In other instances, a filmmaker outsourcing their audio work doesn't know what that audio should sound like

when it comes back to them and sometimes the quality of on-set sound recording makes it impossible to create a satisfactory soundtrack. This can lead to an endless “blame game” and two unhappy parties who will swear they will never work like this again.

Egos can play an interesting part in all of this. I have a personal preference to be able to further edit or amend any work that I outsource, which can rub some people the wrong way. There are also some technical difficulties that may result due to operating system or application compatibility.

The issue of payment for services can also be an issue. Freelancers all have different policies as to how they are paid. Neither party wants to be left with less money than they expected to have at the end of this transaction, but there is, again, no larger institution making sure that the terms that were agreed to are met.

I don't normally outsource much of my work to other freelancers, because, as a freelance filmmaker and through my formal education, I've made an effort to understand how to guide a project from pre-production through the post-production process. There are, however, some drawbacks to trying to do everything on your own. Most times, there is someone who has the knowledge and ability to do something better than you can. Realizing this can be a long and painful process.

All in all, these situations are usually decided by dollar signs. Is it worth what I'll pay to get the product I'll receive (not necessarily the product I want)?

The best thing to do, for both the freelancer and the person hiring him, is to check references and get work through referrals. It's important to be able to verify that a person is capable of satisfying your needs before you make any agreement. In this digital age, the tools to edit audio at a pretty professional level are available and affordable for just about everyone. This has created a freelance market that is flooded with under-qualified engineers and makes the hiring of a freelancer that much more of a gamble.

MF:

What do you think about unpaid "crowd" contributions? Would you be likely to open your work to Web users for modifications (or at least comments suggesting modifications) in the postproduction phase, assuming there was a website that made it easy and useful? Could an "A-list" feature film production possibly do the same?

Quality might increase and production time/costs could potentially decrease, but what might happen to the revenue model and overall viewership? Do you think the crowd of contributors has more or less desire to pay for the finished product they had a hand in creating, and would this crowd be a large enough segment of total viewership to make a significant impact?

Would access to these thousands of opinions actually lead to the most optimal end product, or is movie production better in a top-down model with all production decisions made by successful and similarly minded individuals?

MH:

You've opened quite a can of worms.

The concept of opening up a project to contributions from a large pool of individuals could be very risky business. The wider the net you cast, the more likely it will be that you'll end up with junk in your net. The general populous, and some "professionals," are not trained to produce material at the quality expected for "A-list" material. The entertainment industry is a difficult field to break into, for many reasons, but not the least is the fact that most people cannot perform at that level. If you look at the YouTube model (a site based on work that is submitted without any hope for financial return), it is easy to see what effect the concept of "free" labor can have on video and audio content. It degrades it.

The only thing that keeps people paying for movie tickets and premium cable fees is their desire to see well-produced, high quality content. People will only pay for something they can't create themselves. We can see this affecting the next year's slate of movie releases. An unprecedented number of films will be premiering in 3D next year. The financial success of Avatar was related to the increased ticket price that theaters featuring 3D screens were able to charge. As of this week, 3D televisions will be available for the first time. I'm interested in seeing where this takes us. Panasonic will also be releasing the first prosumer 3D HD camcorder later this year. It's a brave new world, but nobody outside of the industry really knows how any of this technology works yet. Given the

technical requirements needed to render such effects in 3D, we couldn't create these things on our own if we didn't understand how they worked.

Planning for a film, or any large effort in entertainment, requires careful budgeting and scheduling. I can't imagine how any production would survive without any concept of how long post production work would take or what the quality would be when it is done. Not only are these issues taken into consideration before the film is finished shooting, but the postproduction process is already in place before anybody walks on a set.

The concept of a chain of command is also very important in the filmmaking process. There has to be one person at each level of production who is overseeing the work being done. Creative differences and "too many cooks in the kitchen" can lead to a breakdown on a film set and in the postproduction process. The reliability of those working for you is also key. You have to be certain that you are not wasting time or money because, most of the time, it's your money or future career at stake.

This being said, there are some unique advantages to opening up a creative assignment to the artist community at large. I have taken part in several Internet-based commercial video contests in the last year and have received some unique opportunities in turn. I was featured in a San Francisco Chronicle article about one of these contests: <<http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2009/11/27/BURM1AMAPN.DTL>>. I think this article explains the pros and cons of this process better than I can.

Lastly, there is something missing when content is created remotely, or over the Internet. The process of meeting other artists face to face and working collaboratively on a project is often the origin of the best art (technically and aesthetically). Filmmakers spend a lifetime working with some people over and over again and some other meetings are one-time deals. At the end of the day, we all do a few things well and one or two things really well. It's tempting to look to the Internet to fill these gaps in talent or time, but I always have better luck, and results, when I am working with someone I can track down in person or contact quickly if an issue arises. The Internet community is largely anonymous and don't really need to worry about making a client happy, especially if they aren't being paid.

Michael Herbert is an independent filmmaker from Boonton, New Jersey and a recent graduate of the Tisch School of the Arts at New York University.

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