MANAGING WIDENING PARTICIPATION IN MUSIC AND MUSIC PRODUCTION

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Participation in music related activities has soared in recent years. However, the wider participation of musicians and music producers makes it more and more difficult for the genuinely innovative practitioners to be identified within such a large crowd. On an engineering level, home music producers have access to advanced music production systems, but there is potentially an education gap emerging, leaving practitioners with the tools but not the know-how to succeed. This paper investigates and evaluates the current landscape of audio engineering tools and music production methods to identify and map the education challenges created by widening participation. As a result, recommendations for education focus and future product development are generated and presented.

INTRODUCTION

Widening the participation of musicians and music production is an active ambition of many music education boards, instrument retailers, equipment manufactures etc. Indeed a number of valuable benefits gained by participation have been documented [1]. For example, by Jensen [2]:

“With music in schools, students connect to each other better - greater camaraderie, fewer fights, less racism and reduced use of hurtful sarcasm.”

And by Dickenson [3]:

“The foremost technical designers and engineers in Silicon Valley are almost all practicing musicians.”

With recent emphasis on music participation, sales of instruments and home music production systems have soared [4]. For example, guitar sales in 2006 in the USA totalled 2,991,000 - an increase of 260% since 1998. During this period the average price of a purchased guitar has fallen from $579 to $372. The fall in average price indicates that beginners and hobbyists make up a large contribution to the increase in sales, purchasing low-price and entry level instruments.

Technology advance has also contributed to the wider participation of music production, with music recording systems becoming more accessible to the mass market. For example, in 2007 Apple released the new Version 8 of Logic Pro with a 65% price reduction from the previous version. The gradual technology advance in home music production systems has seen the annual US retail market of sound cards and sequencer software raise from $170,800,000 in 2000 to $411,600,000 in 2006.

As with any industry experiencing growth, a number of facilitation challenges are created with the widening of participation in music and music production. Most notably are the education challenges of transferring knowledge to larger and more diverse learner groups.

This paper investigates and evaluates the current landscape of audio tools and music production methods to identify the evolving practical and educational challenges in music production. Evaluation and discussion draws reference to literature review as well as reflections on first hand music production projects, knowledge transfer experience and focus group discussions with musicians and music producers.

OVERCROWDING THE SCENE

The widening participation of musicians and music producers brings a number of practical issues. For example, mass participation could be regarded as ‘watering-down’ the main core of musical talent, making it more and more difficult for the genuinely innovative practitioners to be identified within such a large crowd. The internet has allowed musicians to promote their music to a wide audience. But the audience is potentially saturated by choice, resulting in artists' success being generated by luck more than ability and effort.

Furthermore, the systems of internet music distribution rely heavily on the use of data compressed digital audio. It seems that little emphasis is put on the quality of audio distributed on the internet; moreover quantity, availability and download speeds appear to hold the most importance for many consumers [5]. Owen [6] describes a dual-standard in modern consumer trends given that new high definition television broadcast methods have brought much improved systems for home consumer use. Conversely, similar technology advances within audio technology fields have been utilised to reduce audio quality with the aim of increasing the functionality of download and reproduction systems.

The competitive nature of the music industry, and the desire to be heard above the competition, has caused producers and record labels to demand louder recordings in recent years [7]. Loudness generally reflects the average level of recordings, so mastering engineers are regularly being requested to add excessive limiting, often against their recommendation [8]. Excessive compression and limiting does increase the loudness of audio, but, after the initial impact has worn off, listeners are left with a fatiguing sound lacking dynamic range and musicality. The battle to be heard above the rest therefore sees record labels putting emphasis on loudness above quality, setting a poor example for the listening public.

ASSESSING THE SKILLS GAP

A skills and knowledge gap appears to be emerging with the increased participation in music and music production. Studio level software has become more available to the amateur home producer. Falling prices and the availability of illegal 'cracked' software means that any interested individual can have access to the equivalent audio processing power of the early commercial recording studios. Indeed producer Stuart Price admits that Madonna's recent Confessions on A Dancefloor album was produced predominantly in a bedroom [9]! Unfortunately many of the wider participating users are in-sufficiently motivated or educated to achieve the audio quality associated with professional projects. Access and opportunity is certainly a good thing, but it could be argued that over-subscription contributes to society's general acceptance of lower grade audio and a recent infatuation with quantity of audio above audio quality. Similarly, it has become difficult for a novice user to understand the difference between sequencer packages and the different pricing that goes with them.

Audio processing software, by definition, brings together advanced applications of mathematics and data management in order to achieve functional digital systems. There is generally a need to understand the specific processing taking place in order to utilise advanced systems correctly and fully. Amongst others, sample rates, data resolution and internal bus processing methods all contribute to the final audio quality output from a software system. Software processing tools require the user to have a technical knowledge of the processing taking place. Paul White reflects [10]:

"It takes time to learn what any piece of gear can do, so what chance do we have of using 300 plug-ins to their best advantage, even when they're actually needed?"

This was never an issue in the early recording studios because a new engineer would have to prove their knowledge and experience before being let lose behind a mixing desk. Nowadays there is no such requirement, if you can get your hands on the software, you can get going, regardless of whether you have the technical know-how or not.

A further example is in the technical language used by simple audio packages. Many MP3 generator packages have a 'normalise' of 'volume levelling' option, with no technical explanation about what the process entails. The merits and issues surrounding audio normalisation are discussed and argued in detail by many professional producers and audio engineers, for example Bob Katz [7]. But if even professional producers cannot agree on the best practice for normalisation, then how can a novice software user make an informed choice on this option?

Musicians and performers are also relying on technology more and more. In particular instrument tuning has benefited by technology advance, but sometimes at the expense of performer skill. Guitarists rely heavily on electronic tuning assistants rather than learning to tune by ear. Similarly, vocalists know that a near perfect take can be made perfect with auto-tune software.

Sales of drum kits have increased substantially in recent years [11], but percussion instruments can be the most difficult to tune [12]. This is predominantly owing to the number of degrees of freedom for tuning a percussion instrument. For example, a single tom drum will have two heads, each attached to a drum by a number of tuning lugs. It appears that tuning drums to a desired sound is something that only expert percussionists can achieve, leaving the remainder with a ‘twist and hope’ attitude when tuning or replacing drum heads. This point is argued by Ranscombe who specialises in drum tuning education [13].

Likewise, in the days of early analogue synthesizers, a performer would need to tune and retune regularly, even during a performance. This was owing to the non-linearities and inherent design inefficiencies of early synthesiser systems. The ability to tune and an ear for sound quality were essential skills for any successful musician.

CUTTING CORNERS IN MUSIC PRODUCTION

Studio engineers face a number of acoustic challenges in creating music recordings to a professional standard. However, the abundance of studio hardware and processing tools allows engineers to cut corners rather than solving sonic issues at source [10]. Joe Boyd [14] argues:

“These days most engineers confronted with a displeasing sound reach for the knobs on the console and tweak the high, mid or low frequencies. When that process is inflicted on more and more tracks of a multi-channel recording the sound passes through dozens of transistors, resulting in a narrower, more confined sound. With the added limitations of digital sound, you end up with a bright and shiny, tin and two-dimensional recording. To my ears, anyway”

The development of advanced digital processing systems allow modern music producers a whole number of previously unavailable software tools and plug-ins. The first software products were incarnations of analogue systems simply providing a similar working method in a digital environment. Nowadays software can be used to create, for example, delay times and equalisation curves that could never have been create in analogue. However, the fact that these tools are available can allow engineers to use them just because it is possible.

For example, Tingen [15] reports that mix engineer Tom Elmhirst uses a number of very high Q attenuators to reduce some particularly hard frequencies evident in a vocal track (see Figure 1). In particular, a notch attenuator of -18dB at 465Hz, with a Q ratio of 100, is used. This notch equalization (EQ) is used to mold and improve the overall tonality of the vocal recording. However, the fundamental pitch of musical note $A^{\#}_{4}$ is at 466 Hz and the relative power of this note will certainly be affected by the EQ filter. It is well reported that the musical midrange frequencies (150 – 1000 Hz) are notoriously delicate when equalisation is used [16][17] and in this particular case, the filter width is narrow enough to have no major effect on any other musical frequencies within the midrange. As a consequence, the notch filter will effectively reduce the harshness of the vocalist's voice, but, if the vocal melody includes use of the $A^{\#}_{4}$ note, then there would certainly be a significant attenuation for the period of that particular note. Tingen explains that this corrective treatment was necessary owing to sonic issues with the recorded vocal track. In this case, the required 'fix' highlights the compromises which must be made when corrective treatment is added at a late stage in the production. Digital software EQ systems can allow extreme settings, such as -18dB and Q=100, to be utilised. In many cases, however, the need to use these extreme settings indicates a serious flaw in the production process at an earlier stage.

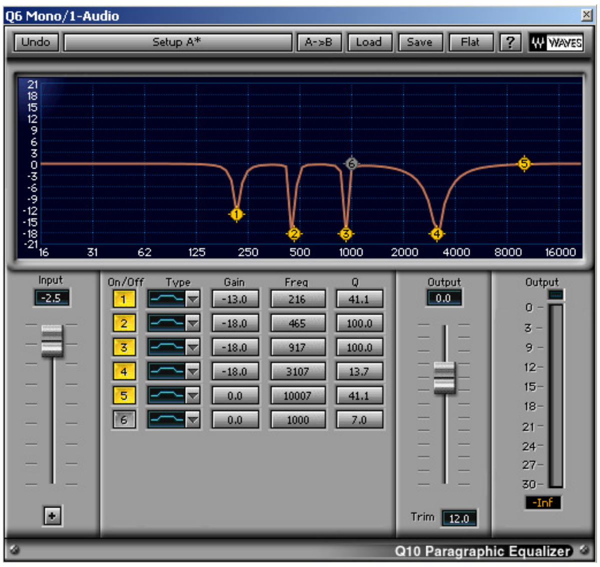

Figure 1. An EQ curve similar to those described by Tingen [15].

A common misuse of equalisation is the boosting of frequencies that are not actually significantly present in an audio sample. For example, many popular texts suggest boosting a kick drum sound in the 3-6kHz region as a method of enhancing the attack of the signal or adding a ’snap’ to the sound [18][19]. However, the audio profiles shown in Figure 2, and those discussed by Rossing [20], suggest that there is little to be gained in boosting in this region, as there is very little frequency content to enhance. The mechanical design of the bass drum does not lend itself to the excitation of very high frequency vibration components. So, even if there is any recorded energy around the 3-6kHz region, it may just be spill from the cymbals or buzz from the spring on the kick pedal.

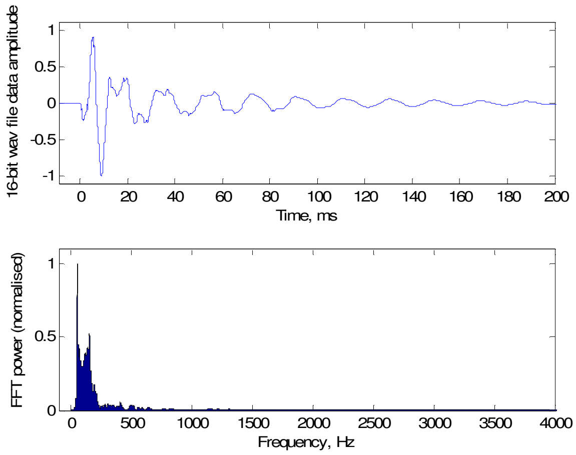

Figure 2. Kick drum waveform and frequency spectrum.

EDUCATION CHALLENGES

Many of the challenges generated with widening participation in music and music production stem from the fact that the fundamentals of audio technology are based on advanced physics, electronics and mathematical theory. This makes knowledge transfer to a musician or an amateur producer a considerable challenge. There is certainly an issue with educating the wide participating base of musicians and producers with the concepts of audio engineering. Practitioners come from increasingly wider backgrounds, some with experience of analogue electronics, some simply interested in music and acoustics. Approaching complex engineering subjects will satisfy some learners, but not others. It is therefore becoming increasingly difficult to satisfy and achieve success with all.

Many popular educational articles attempt to over simplify the subject of audio technology to engage readers. This point is agued by Robjohns, who suggests that common comparisons between audio and film for explaining the concepts of sampling theory are out of place [21]. Miagliari approaches a complex concept of phase cancellation in audio signals with reference to simple sine waves [22]. Indeed, many such educational articles focus predominantly on ideal theory, relating to simple sinusoids, but many do not extend to explain the issues relating to more complex audio signals, i.e. those with multiple sinusoidal components, phase distribution and transient properties. It is felt that, although the popular approach engages with learners, they are perhaps drawn into a false sense of security regarding the complexity of the field they are working. For example, discussions relating to digital sampling theory focus on ideal concepts which are impractical in the field. Given physical design constraints on analogue-to-digital converters and digital–to-analogue converters, and the practicalities of filter design, the idealised sampling and reconstruction theories commonly related to are actually "non-causal and physically nonrealisable" in practice [23]. It is therefore felt that education of such topics should not focus highly on the idealised pure theory and instead provide more detail on discrete numerical theory relating to practical audio systems.

Simplifying mathematical signal processing concepts can lead to learner misconceptions. A common misrepresentation of 'phasing' and comb filtering has led to music producers to develop their own explanations of why something sounds undesired. Phase takes the blame more often than not where the issue may actually be frequency balance, group delay or even colouration from the ADC for example. The fact remains that virtually all electronic and DSP processes add an element of phase distortion to audio signals, some improve the sound, some become detrimental, but it is still very difficult to pinpoint the source of a phase issue and quantify its effect when recording audio.

Educating musicians and music producers in such a wide participating society is challenging owing to student types and learning preferences. Many students want to simply learn about recording techniques and practise in the recording studio. Fewer students studying audio and music technology are interested in electronics, acoustics and signal processing. Unfortunately, this scenario brings a bigger supply and demand issue where graduate jobs are concerned. There remain very few positions up for grabs in recording studios, and as discussed by Mayes-Wright [24], music technology courses rarely act as a fast-track option for these type of positions. Moreover the majority of graduate opportunities for music technology students are in electronics, software, acoustic design, audio forensics and a number of other related areas [25]. Many studio engineers these days are therefore those who are entrepreneurial enough to start their own business, or those who have the best contacts inside the music industry, and not necessarily those with the best practical credentials.

REFLECTION AND CONCLUSIONS

The increased participation in music and music production is undoubtedly a wonderful thing. Indeed, the increased interest and participation feeds technology advance, brings employment opportunities and generates a number of advantages to society such as those discussed previously. Wider participation should certainly be encouraged and embraced.

It is felt that software designers, equipment manufacturers and educators should exercise a focused attitude with respect to audio quality, in order to retain integrity and professional standards. This has been achieved recently with high definition television and Blu-ray DVD, so it should certainly be possible with audio applications.

Audio technology systems should be developed with an informative and interactive focus on understanding and knowledge. Education should be the responsibility of all involved in the music industry. Without education many future technology advances could be overlooked commercially because the consumer market isn't sufficiently knowledgeable to take advantage.

Consistent education methods are also required to ensure clarity and uniformity of knowledge transfer. To date, little research has been conducted on practical teaching methods for audio and music technology. As a result institutions and educational publications regularly employ different and contradictory approaches to covering advanced engineering topics. More consistency in the methods and approaches to knowledge transfer can only improve the unity of the music and music production community and ensure continued growth, participation and technology advance.

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