# Guitar music and technology essay

Art & Culture

Music and technology has always been intertwined and this statement can be illustrated by tracing the history of the guitar. From the time it was first discovered that a vibrating string tied over a wooden box could produced pleasant sounds, plucked instruments of the guitar family have existed (Tyler 33). The way a guitar produces sound already reflects technology itself. When a player plucks a string, the string vibrates and most of the energy is transferred to the soundbox via the bridge. Resonance in the soundbox and the radiation of the soundboard then amplify the weak sound of the string and carries it through the surrounding air. For centuries, guitar makers have worked on these principles to improve the quality of sound played by the instrument (Tyler 34). This essay aims to show how the interaction between technology and music had influenced the development of the much popularized and versatile electric guitar.

The beginning will briefly illustrate the formation of the guitar by describing a few of its earliest ancestors, then the main focus will shift to how pressure from the musical community fusing with great technological advancements of the 20th century had resulted in the guitar of today. Two of the earliest known ancestors of the modern guitar came from the 16th century, which includes the vihuela and the four-course guitar. Of the two, the four-course guitar most closely resembles the guitar of today.

Because it was expensive to own a vihuela due to its meticulous construction by hands, the vihulea became an instrument of the aristocrats. On the other hand, the four-course guitar was easier to produce and was more economically to own making it more popular with the general public. You would hear it in the villages while the more refined vihuela was usually

preferred in the courts. The vihuela with six courses and the four-course guitar were all played with strings tuned in pairs, each pair being called a course. Toward the end of the century, the addition of a fifth string gave the guitar a broader range and greater sound.

The five-course guitar eventually replaced all other types (Tyler 36-37). From the early 17th century to the 18th was not a very productive time for the guitar, yet it was during this period that an important advancement to the guitar took place. The guitar was first used purely as a strummed instrument.

Its five courses, tuned in octaves, made it an ideal accompaniment to the popular songs and dances of the time (Grunfield 11). Gradually, it began to adopt its present method of stringing, by using single strings instead of the courses that had originally given plucked instruments their characteristics tone colors. The six-string guitar became extremely fashionable.

Two great players in the early 19th century, Fernando Sor and Mauro Giuliani toured Europe and astounded audiences with their skill and brilliancy. However, they played on smaller guitars than what we are accustomed to nowadays. The vibrating string length was only about sixty centimeters. The methods of construction were also not sufficiently developed to allow the guitar to achieve its full potentiality of resonance and volume (Evans 15). Thus, the instrument would have remained in the backwaters of musical creativity if Antonio de Torres Jurado did not attempt to create a more expressive kind of guitar. He increased the depth of the instrument, giving it more sonority. He also altered the shape of its curvatures and increased the

overall size of the guitar, ultimately producing a more mathematically accurate structure with a vibrating length of about sixty-five centimeters.

This measurement is still regarded by craftsmen today as an ideal size for the instrument in terms of volume, tone production, and ease of playing (Evans 16). Torres' used of available tools at the time to craft his guitars to such precision signify one of the early interaction between music and technology. The need to produce better music had led to the modification of the current instrument through new technology. The development of the steel-string acoustic guitar and the electric guitar greatly symbolizes the technological advancements that have shaped the instrument. The use of steel strings instead of the nylon ones, used by the classical guitars, brings about a fundamental change in the sounds of the guitar.

Steel strings produce a loud volume, and a twanging and jangling tone. The reason is that steel strings are very true and efficient vibrators, whereas a nylon string only produces a note with about six to ten overtones. A note struck on the steel string can have in excess of fifty overtones. As steel-strings exert a heavy pull on the neck and table with great vibration efficiency, they can transfer a lot of energy to the top of the guitar and produce more volume (Grunfield 35). Early in history, the nylon-string guitar was restricted to classical music. The steel-string guitar produced a new sound and became an important influence on the development of the blues.

Blues was first and foremost a vocal art with the instrumental accompaniment in a subordinate role. The guitar was most suitable for this

purpose as it has some of the flexibility of the human voice. You can bend and flatten a note.

nd the use of the droning sound of the guitar played by sliding down the strings can achieve the necessary interaction of sound. In the early 20th century, the steel-string guitar was adopted by almost all of the blues singers and was synonymous with this genre of music (Grunfield 37). From the development of the steel-string guitar leading to the electric guitar is a clear evidence of how music and technology is always intertwined.

When the dance-band guitarists of the late 1930s wanted to be heard above the rest of the band, they attached microphones to the body of the guitar. But this resulted in too much feedback (Evans 20). With the application of advanced electronic and engineering techniques available in the 20th century, magnetic pickups were developed through experimentation with Gramophone pickups. Coupled this with the use of amplifier and loudspeaker have given the guitar better versatility than ever. The body of the guitar was made to be very heavy, by using a metal bridge, to keep the vibration in the string and to radiate as little of the energy acoustically as possible. Metal strings are more flexible and have less internal damping than do nylon strings, and they are able to vibrate much longer in high-frequency modes.

The next step is to have the magnetic pickup transforms the mechanical motion of a vibrating string into a varying voltage. The basic pickup consists of a magnet, of which one pole points toward and one points away from the strings, with a wire coil wrapped around the magnet. When the gap between

the string and the pole piece changes, a voltage is created in the coil proportional to the velocity of the string’s motion.

Changing the location of the pickup along the string’s length can change the quality of the signal produced. Most guitars have two or more pickups, allowing the player to create composite sounds. Once the pickup has produced a voltage whose frequency and amplitude are proportional to the string movement, the signal must be amplified in order to drive a loudspeaker. The loudspeaker performs one of the same functions as the soundboard of the acoustic guitar; it radiates the vibrations of the string into the surrounding air so that they may be heard. The mechanical movement of a steel string induces a voltage in a coil of wire wrapped around a magnet, while the electrical signal applied to a loudspeaker coil induces a magnetic field that changes in value according to the amount of signal variation. The magnetic field moves the cone attached to the coil, and this motion in turn changes the sound pressure of the surrounding air, thus producing sound (Evans 22-25). The invention of the electric guitar signified a new era where the instrument no longer plays a subordinate role, and it was among jazz musicians that the guitar found its first great role.

Before, the guitar was restricted to relatively small groups because of its low volume. Also, its main role was to provide accompaniment for the other solo musicians. With amplification, the electric guitar was incorporated into bigger bands and was used as a solo instrument as well. One of the pioneers of solo jazz guitar is Charlie Christian. He displayed an inventiveness of melody and harmony unique among electric guitarists. By using the sustain

and tonal properties of the instrument, Christian produced clear ringing lines perfectly set off by the big band backing (Evans 30).

However, the most important contribution of the electric guitar to music and popular culture was that it singularly defined the sound of rock n roll. Rock n roll was intimately tied up with the emergence of a youth culture after the Second World War. The loosening of social attitudes and increasing prosperity had helped create a young audience who cared little for aspirations of their parents. As rock ‘ n’ roll’s popularity grew, the instrument associated with it, the electric guitar became a symbol of youth. Countless small groups started to play at local clubs and dance halls in both America and Europe making the electric guitar the new urban folk instrument (Evans 33). In the meantime, technology continued to improve and invent new sounds for electric guitars. One of the most important developments is by overloading the input amplifier until the upper limits of the amplifier clip the output signal.

This adds distortion and sustain to the sound. The amounts of distortion and sustain are increased by increasing the amplitude of the input. The developments of effects like fuzz and wah-wah sounds are added to the range of sounds already available to electric guitarists.

This paved the way for louder, heavier music like rock and eventually heavy metal (Schneider 11). The 1960’s brought to prominence bands like The Beatles and The Rolling Stones. They were the first groups with an international following that verged on the hysterical, and were greeted with an enthusiasm everywhere. With the new technology that came with the

electric guitar, the music played by rock bands was getting progressively louder and heavier. The grand master of manipulated sound was James Marshall Hendrix. He could play undistorted lead on some strings while getting feedback on others, a trick which made guitarists listening to his records at the time speculate on the identity of the second and third guitarists.

No one fully understood his technique, and no one since then has been able to reproduce his mixture of sounds (Evans 35). Sound manipulation, distortion, and feedback pointed to a new concept of the electric guitar. From being a conventional musical instrument on the one hand or a stage prop on the other, the electric guitar became the heart of the sound system, in which artificially induced noise was as legitimate as a musical note. One drawback of the electric guitar has always been the necessity of a cord to connect the instrument to the amplifier. This results in the physical danger of tripping over the cord and the risk of electrocution. The cords inherently also have a limited frequency response due to electrical property of the capacitance. This means that a cord longer than fifteen feet begins to act as a low pass filter. Replacement of the guitar cord with a wireless transmitter eliminates all these problems.

The cordless guitar system consists of a battery-powered transmitter and a receiver. The system can be the FM tunable type or the VHF fixed-frequency type (Schneider 41-42). Not only did this development have a resounding effect on the quality of sound during concerts but it also gave rise to concerts being visually spectaculars. From the late 70’s and on, rock bands not only had to sound good, they had to be flamboyant and utilize the stage

as a platform for physical showmanship. The removal of restrictive cords meant they could fully manipulate the space onstage.

It was common to see guitarists jumping off platforms and running everywhere to heighten the mood of the concert (Evans 35). As we have seen through the span of many centuries, the need to play better music combine with the constant advancement of technologies have allowed musicians and guitar makers to improve the guitar with both better quality sounds and more ease of use. The guitar is very receptive to new forms of music, while at the same time maintaining its importance to older forms. In the current era dominated by electronic music produced with high tech computers, some may believed that electronic music like techno and trance spells the death of the electric guitar as the computer can manipulate and create sounds from every instruments (Schneider 11). However, the electric guitar is extremely versatile and since it is already electronically driven, it provides a platform where a musician can combine the forces of old school playing techniques and digital manipulation to create a new and exciting sound.