MUSC 6010-001

Fall 2020

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Technology, Innovation, and the Democratization of Music Accessibility

Whether engaging as a listener or creator, music has become ubiquitous in almost all cultures around the world. Each region of the world has its own flavor of music, characterized by the customs, traditions, and aesthetics of its people. Music has even come to be described as a "universal language" by many. But music wasn't always a language commonly spoken among the masses. For a long period in its early stages of formation, music, especially Western musical traditions, wasn't nearly as accessible as it is today. While some early indigenous cultures of Africa and the eastern hemisphere utilized rhythm as a ritual in spiritual ceremonies (Floyd 1995, 19), the engagement as creators in music in Western societies was a privilege enjoyed only by the few with access to mentors and financial beneficiaries. The opportunity to learn the fundamental components of music, like harmony and rhythm was out of grasp for most of society, and access to instruments was a distinct privilege not afforded to lower class people. Instrument building and repair was a unique trade practiced by highly skilled craftsmen, making the price of instruments very high. As the music of Western traditions has evolved, the development of music technologies has been the leading factor in improving the accessibility and democratization of music engagement for people around the world. In addition to industrial and economic growth, technological innovation in acoustic instrument building and in digital music technology have been the most significant contributors to the democratization of music accessibility.

What is music accessibility? What does it mean for music to be accessible, or inversely inaccessible? Jochen Eisentraut tackles these questions and provides a working definition for an

otherwise ambiguous and broad term. In his book, *The Accessibility of Music: Participation, Reception, and Contact*, Eisentraut proposes a system of three levels to address the different aspects of musical accessibility (2012, 21). Level I is concerned with the the physical contact between music and listener. This is the necessary physical distance that separates a person from a music listening or creating experience, like a concert or inability to use an instrument. Level II is about personal reception. Can a person engage with music cerebrally by recognizing the components of the music such as harmony, melody, rhythm, and formal structure? Or perhaps the engagement is physical, using music as a tool to sustain energy for work, or to calm the mind for study. The underlying question of Level II is when does the sound become a musical experience, differentiated from environmental noise? Finally, Level III is concerned with participation in a musical experience. This can be creation or performance of music or indirect interaction with music, like dancing socially.

Eisentraut points out that socioeconomic factors have been a determining factor of music accessibility, arguing that "since sound carriers became generally available around the turn of the twentieth century, technology has increasingly made it easier for many people to hear and 'own' music" (2012, 34). Members of developed nations wouldn't give this a second thought. In the 21st century, listening to just about any song is a quick search away, thanks to modern cell phone and music streaming technology. As Bozanic argues, however, "prior to the advent of commercial sound recordings, people relied on producing their own music, whether in private spaces at home or in public spaces such as general stores, bandstands, and churches" (21). Before recorded music, the only way to experience music was live performance, and for the most part, people needed to create that music themselves.

Until the 20th century music creation was limited to people in higher social classes, as access to a music instrument, like a piano, was out of reach for people of lower social classes. Not only were the early keyboard instruments like the harpsichord or pipe organ expensive (without mentioning the size), the creation of music also required the benefits of music education and training in order to operate a keyboard. Even as increased manufacturing of pianos in the mid 1800s increased in developed countries like Britain, the innovations and availability of the *pianoforte*, as it was initially known, was still limited to upperclass families. "Symbolizing a status of wealth [the piano] was an object that provided entertainment and decoration, being both a musical instrument and a substantial piece of furniture. Its ownership conferred status, symbolic as it was of gentility, family life, taste, and wealth" (Carnevali, and Newton 2013, 39). Pre-industrial revolution production practices prevented the economy of scale and the quality that could have made the piano accessible to lower-income families.

Two of the main factors that eventually improved the accessibility of the piano to other socioeconomic classes were the technological advances of both the industrial revolution and of the Steinway family. The industrial revolution was a huge period of growth in which mass production techniques and improvements in technology allowed manufactures of goods of all kinds to increase their economy of scale to create products that were increasingly affordable (Hounshell 1984). The Steinway family emphasized this in the two decades that it took them to achieve world leadership in the piano industry. Their technological innovations increased the popularity of a more rugged and accessible upright piano in America, improving upon the otherwise unpopular design, implementing superior technological designs like overstraining, and a single-piece iron frame. This provided access to a piano that was not only more affordable, but also main-

tained a quality and ruggedness that proved to appeal to more American families (Ehrlich 1990, 47-67).

The guitar is another case study of how improvements in technology increase accessibility. Much like the piano, the guitar "was viewed as a parlor instrument to be found in middle and upper class homes" (Bozanic 2015, 29). As Bozanic elaborates in the introduction and first chapter of his PhD dissertation, "*The Acoustic Guitar in American Culture, 1880-1980,*" the guitar's rise beyond the Victorian parlor setting to become an important and ubiquitous part of American culture would not have been possible "without the advances in how guitars were manufactured and sold during a period of profound technological and social change" (30). As with the piano, the guitar was made more affordably and on a larger scale thanks to technological improvements in manufacturing and production. By implementing technological innovations in the design of the guitar as well, more Americans were now choosing the acoustic guitar as the instrument of choice thanks to its quality, ruggedness, and portability as a smaller instrument. The affordability of the acoustic guitar began to solve the first level of accessibility, the physical distance that separates the listener from a music creation or listening experience.

The innovations in design of the American acoustic guitar improved levels two and three of accessibility as well. Level II is concerned with personal reception and understanding, and level III with direct or indirect participation. The instrument was one that musicians of varying skill levels could engage with and "with a limited amount of skill already built into the guitar, a beginner could quickly master the basics of the instrument" (Bozanic 2015, 5). Additionally, growth of jazz ensembles in the 1920s led manufacturers to incorporate continued technological advances in the guitar to help it fit into more musical environments. Experimentations in steel strings, larger models, and resonator guitar parts helped amplify the guitar to compete dynami-

cally with the winds and brass in larger concert hall venues. As developments continued, many musicians would opt for electronically amplified guitars, a continued growth that would peak in the 1980's as the electric guitar reached an apex in American culture.

As we have seen in the case studies of the piano and guitar, technological improvements in both the manufacturing and production as well as in the design of the instruments would improve accessibility of music in all three levels. The guitar can be viewed as a superior instrument in this regard. Not only was it cheaper and more portable, but it also had a design that allowed even beginners to engage very quickly with music creation. It was this improved accessibility that caused its rise as an American cultural symbol, and led to music styles that would define the genre of American folk music (music played by the common-folk).

As mentioned previously, the advent of sound recording technology would be the biggest improvement in reducing the barrier to level I of accessibility. Leyshon articulates, "[s]ince the development of Edison's first recording device in the late 19th century, the musical economy has evolved in lockstep with technological innovation and development" (2009, 1319), but to the expensive and esoteric nature of early developments in analog recording equipment, however, the studio sector would remain "privileged sights of knowledge and expertise" (1319). Record companies such as Warners, RCA, and Columbia built their own studios in an effort to consolidate a vertical integration of the musical economy. These large studios worked to that end, becoming sites of profound technological innovation, but much of the equipment used in the studios was "available only within that company's studios" (1319). Innovations in recording technology after World War II, however, have worked to lower the cost and barriers to entry in the recording sector. These include a deflation on the cost of sound recording equipment as a result of surplus military technology, and the technological development of tape as a recording medium (1322). In

lowering the cost and barriers to entry to the recording sector, Leyshon points out, "[d]igital recording and the use of software are just the latest stage in this process" (1319).

Following a trajectory similar to the examples we have discussed, the rise of the personal computer and affordability of the laptop has been the most effective agent in the democratization of music accessibility, specifically, the Digital Audio Workstation, or, "DAW." Alex Case, writing for the *New Grove Online* music encyclopedia, describes the Digital Audio Workstation as "a combination of computer hardware and software used for the computer-based creation of recorded music through multitrack production" (Case 2014). In *DAW Democracy*, Adam Patrick Bell (2015) succinctly outlines the advent of digital audio workstations, describing Simon's (2004) theory that the ability to multi-track record and "overdub" led to the fragmentation of the professional studio market into a larger number of "project studios," home studios where commercial work is performed (Bell 2015, 132). By the 1980's, home recording gained more popularity with the release of affordable multitrack cassette recorders, and DAWs became affordable by the early 2000s, thanks in part to the early circulation of 'cracked' or illegally obtained versions of DAWs (132). Case (2014) reflects this sentiment, arguing that "[b]y digitally processing audio, the sound recorder can step away from a specialized world of proprietary analog devices and step into the broader market of computer-based digital signal processing. As a result, the recording studio is now easily and affordably available, and progress and innovations occur at the aggressive pace of the digital economy. Such democratization opens the field of sound recording to novice enthusiasts and musicians…" (2014). Not only has the digital audio workstation become more affordable, but for many laptop owners it's actually free. Adam Bell explains that "[m]usic-making applications such as Apple's GarageBand often come pre-installed with the hardware" (Bell 2015, 45). That means that the same computer that the student uses to write her essay, that

the receptionist uses to manage appointments, and the small business owner uses to log expenses, is also a highly powerful musical instrument.

By the end of the 2010s, the DAW as a music platform had taken over as the top music creation platform. Reporting in 2011 from the infamous SXSW festival held annually in Austin, Texas, Rosie Swash (2011) describes how the festival has been transformed by computer based musicians. In previous years the festival was a hub for live band performance, but now electronic musicians dominated the scene and an interview with Imran Ahmed, A&R director of XL Recordings, shows the role the computer has played in bringing opportunity to young musicians around the world, with Ahmed arguing, "The equipment is accessible – all you really need in most cases is a Mac laptop – and the platform for getting it out there on the internet is universal" (Swash 2011). Part of what has made it possibly for young amateur electronic artists to gain notoriety is the advent of music streaming services. Souncloud is one such platform that makes sharing music online a short and easy process. While artists used to go through labels and distributors, the democratization of streaming technology has allowed anyone to easily share their music around the world, gaining feedback and fans along the way. As Souncloud's vice-president, Dave Hynes, elaborates, "Making music is getting more and more accessible…. [Soundcoud] empower[s] this new generation of music-makers to share their creations and get feedback" (Swash 2011).

Improved accessibility in the 21st century doesn't stop at PCs and MacBooks. As Alexander Bonus argues, writing for *New Grove Online*, portable electronic communication devices "have become robust platforms for digital audio production composition, and music performance since the beginning of the 21st century" (2016). As mobile phones become more powerful with ongoing innovations, they are able to handle more processing power to host DAW like

music creation. Mobile phones have also improved level two of accessible (subjective interaction). Music creation apps on the mobile phone are very user-friendly, and reduce the barriers to entry for even beginners who have no experience in music. As Bonus elaborates, "[c]hampions of smartphone instruments point out that users who are musically untrained in the traditional sense can now compose and perform without understanding notation or acquiring skill on an acoustic instrument" (2016). This is an important improvement in accessibility, especially for people who are unable to operate an acoustic instrument due to physical disabilities.

The DAW has been gradually making its way into music education too. In an effort to reduce cost technical and cost barriers for her students, Gena Grehr (2019), champions a modern web-based DAW called Soundtrap, a program that runs on an online web page rather than on a desktop. This is highly advantageous for students, Grehr, argues because it "allows all [of them] to work on the assignment from anywhere, even their mobile devices, so they are not tied to [their] school's computer lab or one specific operating system" (2019, 1). This means that the same music production software can be accessed on a high-end Macbook or a more affordable Chromebook. With the growing affordability of cell phones, music creation programs like Soundtrap are becoming more accessible. Further, Soundtrap has a range of price points that offer more robust options. For someone with a low budget, the no-cost Basic version will allow them to get started making music while the "Premium" education license features more robust sound options (1).

Soundtrap has a feature that greatly improves the first level of accessibility (physical distance). Using the web-based DAW over the internet, users can participate in live, real-time collaboration from anywhere in the world. All they need is an internet connection to join a session

where users can live chat and collaborate on a musical session, using the computer keyboard to operate the online piano keyboard.

The development of computer music technology has not diminished opportunities for people who are interested in acoustic instrument music. Continued technological innovations in the 21st century have improved the accessibility of acoustic instruments. One example of groundbreaking technology in modern music instrument accessibility is the the Hovalin by Hova Labs. With the creation of consumer 3d printers in the 21st century, people can now print products at home by acquiring the digital blue-print for a product. Hova Labs has used this technology to create a 3d-printable violin that costs less than $70 in materials (Hova Labs, 2019). The blueprint is available open-source, so anyone with access to a 3d printer can download the schematics to print their very own violin. For those without direct access to a 3d printer (or the knowledge to assemble the final product), Hova Labs offers pre-printed Hovalins, at fractions of the cost of a normal violin. This is a great, affordable entry-level option for beginners and the construction using polymer plastic means that it is durable, which makes it suitable for shared environments like public school systems.

Whether it's acoustic instruments like piano, guitar, and violin or contemporary computer-based music software programs, the trajectory is similar: as technology develops, music becomes more accessible. This relates to all three levels of accessibility; the physical instruments and computer hardware becomes more affordable, improving the level one of physical distance and new ways of music creation and user-friendly software instruments improve levels two and three of accessibility, subjective understanding and direct or indirect participation in music. With new challenges facing the world, including a world-wide pandemic, music is so important to bring joy and sanity into our lives. If we can't be close physically, we can still engage musically

online through collaborative Soundtrap sessions, sharing open-source creations, and listening to each other's music on Soundcloud.

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