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Can We Afford These Affordances? GarageBand and the Double-Edged Sword of the Digital Audio Workstation

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Abstract

The proliferation of computers, tablets, and smartphones has resulted in digital audio workstations (DAWs) such as GarageBand in being some of the most widely distributed musical instruments. Positing that software designers are dictating the music education of DAW-dependent music-makers, I examine the fallacy that music-making applications such as Apple's GarageBand are "easy." It is of the utmost importance that the music educator be able to critically assess how DAWs such as GarageBand influence the decisions of music-makers. Based on J.J. Gibson's concept of the affordance, I provide a framework with which to evaluate music-making programs using the criteria of presumptions, privileges, provisions, protections, and preventions.

Keywords: *affordances, digital audio workstations, GarageBand*

The catchphrase of the protagonist in my favorite childhood cartoon was "I have the power!" Every time I heard these four words, the six-year-old me had a Pavlovian reflex of excitement. Without fail, every day after school I was mesmerized by this television show that recycled the same plotline from the previous 22-minute episode. Predictably, partway through each program, when trouble brewed in the land of Eternia, the mild-mannered Prince Adam conjured the mystical powers of Grayskull and shed his lavender tights and pink v-neck with cut off sleeves to transform into someone so manly that his name was comprised of a masculine pronoun *and* noun: *He-Man*! Surrounded by flashes of lightning and triumphant theme music courtesy of a synthesized trumpet, He-Man's booming baritone-proclamation, "I have the power!" signaled to all the young boys[1] who tuned

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in religiously that good would prevail over evil. The superpower-via-object premise was a staple of the cartoons I consumed as a child: *the Mighty Hercules* was a mere mortal without his magic ring, *the Gummi Bears* gulped "Gummiberry Juice" to jump their way to justice, and one of the most iconic animated rock bands of all time, *Jem and the Holograms*, would not have been possible without Jerrica's high tech earrings.

As ridiculous as these analogies may seem, we live in a tech-saturated culture that communicates a parallel message with regard to music: possession of music technology is the key to unlocking the hibernating musician within. For example, Apple continually airs advertisements framing a musical world in which the iPad is the axis. Diverse peoples are depicted engaging with this chameleon instrument that caters to the musical cultures of its users. Apple frames its iPad as a *universal solvent*, a new "solution" to music-making that results from "dissolving" the barriers that prevent people from experiencing their untapped musicality. This strategy has been effective to the extent that classrooms are beginning to embrace the iPad as the crux of the digital native band in which tapping and tilting tablets are touted as the musical actions of the future.

The purpose of this article is not to pick apart Apple or its PC competitors, but rather to problematize the reality that software developers are the music educators with the greatest reach and influence in the computer-dependent world. The purchase of a smartphone, tablet, laptop, or any other personal computing device entails the purchase of a music education. Music-making applications such as Apple's GarageBand often come pre-installed with the hardware, covertly delivering a curriculum conceived by creators of computer software. GarageBand belongs to a branch of music-making programs generically referred to as digital audio workstations (DAWs), a software categorization that has evolved since its origins as simply an audio editing application that ran on specialized "workstation" computers. Most DAWs share in common the capability to sequence, record, and mix music, but increasingly can be "played" using soft synths (software synthesizers) that emulate every instrument imaginable. Having an understanding of the functionality of the DAW is critical for the music educator because most musics that pass through loudspeakers and headphones have at some point been mediated by a DAW during

the music-making process, thus "The recording is the closest thing we have to a universal music condition" (Milner 2009, 12). What was once a technology reserved for professionals in the recording industry is now as ubiquitous as the word processor. Learners of all ages and abilities, inside and outside of schools, carrying an all-in-one musical-instrument-recording-studio with them at all times is an exciting prospect for the music educator as, "Software and code have made possible a regime of more distributed musical creativity" (Leyshon 2007, 1325). Quinn (2007) asserts: "Music technology offers a way into music, specifically composition, which is potentially free from traditional constraints and makes the study of music more accessible to more students" (28). Yet, this perceived democratization and resulting proliferation of this technology has been met with resistance by technologists and educators alike, even by the co-founder of the first mass-produced DAW, Evan Brooks: "Pro Tools was all about egalitarianism, bringing those capabilities to literally anybody ... Unfortunately, if you allow anybody to make music, anybody will make music, which is a whole other set of unintended consequences" (as cited in Milner 2009, 299). Regelski (2007) echoes this sentiment:

> Although the ever-new array of composition software is frequently marketed as though for musical dimwits, results are limited primarily by the musical skill and knowledge of the user—abilities that can be advanced by school-based composition studies. (36)

Although unnecessarily inflammatory,[2] Regelski's remarks regarding the marketing of composition software—which I interpret as including DAWs—are accurate. Essentially, both Brooks and Regelski point to the problem of harnessing the power of the DAW. Adroitness with music technology such as a DAW is not necessarily indicative of musical mastery just as being adept with a word processor does not make one a literary laureate. Once an investment has been made in some music-making technology such as a DAW, is an ersatz education inevitable because it is dictated by software design? Or is this a frame of mind trapped in technological determinism? (see Ruthmann et al. 2015) Théberge (1997) contends: "Such an attitude assumes...that the machine is already more-or-less complete and given. What I want to suggest here is that the machine, too, is, in a sense, 'created' by the user in the act of making music" (160). Brown (2015) avers:

> Digital technologies have their own design characteristics that determine a particular set of musical possibilities, some that are obvious and others that are less so. As such, technologies, old and new, are never neutral or invisible in the music-making process. (16)

In response to Brown, Dillon (2007) charges: "we need to examine what the technology reveals, what it conceals and identify whether what is concealed functions as a focusing mechanism for pedagogy or a limiting filtering mechanism for expression or understanding" (19). This line of thinking constitutes the central issue to contemplate for the music educator embracing DAW-based music-making. Combatting the pre-programmed music education embedded in the DAW hinges on the analytical ability of the educator to recognize the affordances, constraints, and conventions of a technology.

Affordances, constraints, and conventions

Consider the following hypothetical situation: A teacher distributes a piece of paper and pencil to each of her students and instructs: "make music." We could expect various outcomes to unfold from such an open-ended task, ranging from students writing traditional notation, co-opting their pencils as drumsticks to beat on their desks, or embracing their inner-Cage by exploring the sonic qualities of paper such as crumpling and ripping. Without the paper and pencil, none of these actions would have been possible; the implements act as constraints that guide—albeit very loosely in this example—the actions of the students. These constraints are not necessarily good or bad, determining their value or lack thereof depends on the context: "Objects do not possess sociality, people do, and it is through the embodied nature of inter-subjective human social action that objects come to have contingent relevance" (Gibson 2006, 185).

Gibson (1977, 1979) labeled the actions made possible by an object "affordances," referring to the relationship between people and objects, positing that affordances exist independent of perception. Norman (1988, 1990) popularized the idea of the "perceived affordance" to specify that as a design principle, the matter of concern is what the user perceives as an affordance. Conceptually "conventions," "constraints," and "affordances" seem similar and are often used interchangeably, but Norman (1999) specifies that "a convention is a constraint in that it prohibits

some activities and encourages others," adding, "Conventions are not arbitrary: they evolve, they require a community of practice" (41).

Musical instruments and affordances

Gibson's (2006) examination of the affordances of jazz instruments provides a methodical example for investigating the affordances of musical instruments in general, which can be extended to include DAWs. Based on his interviews with 35 jazz musicians in Manchester and London, Gibson compiled an explication of the ways in which jazz instruments afford certain musical actions and how performers have navigated those affordances. For example, the string height on a double bass directly affects the resulting volume emanating from the instrument as higher string heights generate more volume and vice versa. Amplification technology reduced the necessity for high string heights and simultaneously afforded performers to play faster and higher on the easier-to-play strings positioned closer to the fingerboard. Gibson provides several other examples such as the trumpet's privileging of playing through scales as opposed to arpeggios due to the fact that the embouchure adjustments are more demanding for the latter; the piano on the other hand is well-suited for arpeggios due to the spacing of the keys, and the trombone and glissando go hand-in-hand due to its slide valve mechanism.

While the affordances of an instrument guide user actions, they are not necessarily deterministic. Employing the guitar as an example, Gibson explains that the path of least resistance is to play chords consisting of fourths because it is tuned to fourths (with the exception of the second and third strings tuned to a third), but the player is not constrained to these actions and may develop "accumulated sensibilities" (Théberge 1997, 159). A brief perusal of the development of guitar techniques in rock helps to illustrate how the influence of specific techniques more easily afforded by other instruments is important. The technique of two-hand tapping popularized by Eddie Van Halen provided guitarists with a method to mimic the virtuoso speeds of their classical piano influences like Mozart and Beethoven. Inspired by hip hop turntablism, Tom Morello of Rage Against the Machine developed a technique for electric guitar and pedal effects to emulate scratching. Inventing new ways of playing an instrument by challenging conventional

approaches is essential to evolve technique, and these innovations often stem from the perceived limitations of the instrument. Sennett (2008) makes this point more generally about the use of tools:

> Getting better at using tools comes to us, in part, when the tools challenge us, and this challenge often occurs just because the tools are not fit-for-purpose ... the challenge can be met by adapting the form of a tool, or improvising with it as it is, using it in ways it was not meant for. (195)

The computer, a tool invented for calculations, serves as a prime example of this phenomenon. The IBM 704 (note that the "B" stands for "business") was repurposed to "sing" the song "Daisy Bell" in 1961 at Bell Labs with software designed by Max Mathews and John Kelly. Almost a decade before the "Daisy Bell" feat, Raymond Scott repurposed electronics to create musical instruments resembling the modern day synthesizer and sequencer, "pioneering explorations into synthesized minimalism and ambience prefigured subsequent works by Philip Glass, Terry Riley, Kraftwerk, and Brian Eno" (Winner 2008, 184). Even before these breakthroughs, jazz guitarist Les Paul had observed the use of overdubbing in Hollywood in the early 1930s and made it musical by honing the technique using a homemade disk cutter (Shaughnessy 1993). By the late 1940s, Paul produced pristine overdubs with disks and experimented with recording speeds to create novel effects such as the inhumanly fast riffing on display in "Brazil" (1948).

None of the aforementioned technologies were originally conceived to serve as conduits to music-making, let alone musical instruments in their own right. Even Edison's phonograph, which is recognized almost universally as a music player, was originally intended to serve as machine for business dictation (Morton 2004). Programming, sequencing, and overdubbing are now entrenched as commonly used musical actions with DAWs, but the roots of these actions germinated in other fields such as computing, electrical engineering, and filmmaking. Following this tradition of musicians infiltrating the technological sphere to repurpose machines for music-making, micro-processor-dependent devices such as the personal computer and smartphone have been increasingly coopted for musical ends, making them the most mass-produced musical instruments in the marketplace.

In the garage

In the garage
I feel safe
No one cares about my ways
In the garage
Where I belong
No one hears me sing this song
("In the Garage" by Weezer 1994)

A garage band and GarageBand are very different constructs, but they both symbolize a retreat to a musical space, be it physical or virtual. The need for a band to retreat to a garage is typically related to the sheer volume of volume they produce. Often dimly lit and unheated, the garage has come to symbolize more than shelter for the automobile, it is the place where rock happens. GarageBand offers a similar retreat in the virtual realm, easily accessed with Apple iPhones, iPads, and Macs; it is the Minesweeper of the 21st Century, an escape from the spreadsheets and documents that compete for screen space and screen time. The key difference between a garage band and GarageBand is that the former is typically associated with a group pursuit whereas the latter tends to be a solitary endeavor. Quinn (2007) frames the experience of the single member DAW band in a positive light, echoing the sentiment of the lyrics for "In the Garage" quoted at the beginning of this section:

> Perhaps it was something to do with the solitary hours which I had spent writing bits and pieces, the individual engaged with a computer, which allowed that deep relationship to develop ... my bedroom studio was a place of solitude, a private world where I was able to take things at my own pace, a place to both lose and find myself. (24)

How does a DAW foster a music-making experience to both lose and find oneself? The ethos of the garage band is to feel unimpeded, to freely pursue any musical path. How well does GarageBand simulate this aspect of the garage band experience? Is there a musical Garden of Eden in the iPad, or is everyone just being played by an Apple? In search of this utopia, I found Adam...

The Wizard of DAWs

The Technology Band at PS177Q in Queens, New York led by Adam Goldberg is awe-inspiring. Making ethereal and ambient anthems atop the aluminosiliciate glass of their iPads with nuanced hand gestures, Goldberg's class of adolescents with various

Special Needs transmute their tablets from the gaze-inducing screens that most people use for text-based tasks to individualized instruments that comprise a synergistic sonority. In the context of Goldberg's classroom, the iPad is advantageous because of its adaptability:

> I am able to use the iPad to create a highly accessible music-making environment for my students, whether individually, or as part of an ensemble. Because each iPad can be modified, via the huge variety of apps and the modifications that can be made within many apps, to suit each student's learning needs and abilities, I can optimally challenge each student so that they grow as musicians, both in an individual sense and as part of an ensemble. Regardless of student ability, each can find their own voice, expressed within a group of students of widely varying abilities. (personal communication, September 22, 2014)

Congruent with the social model of disability (Lubet 2011; Strauss 2011), Goldberg's vocabulary does not include the term "disability," instead he refers to his students' *abilities*. Stras (2009) has discussed how "disability" in music is typically associated with the physical body; the implication being that a person unable to "correctly" play an instrument is unjustly labeled as "disabled" when the socially constructed context is at fault. Goldberg lauds the iPad for inverting this paradigm because it can be modified, *enabling* music-makers as opposed to *disabling* them by making possible "a highly accessible music-making environment." The "barriers" posed by other instruments and music-making contexts can be subverted with the versatile iPad:

> I'm coming from classical background. But for people who can't, and don't have the resources, if you give them something like this as a musical instrument you can really kind of break through barriers and teach so much of the art of the whole process of music-making (Goldberg as cited in Westervelt 2014).

With powerful technology such as the iPad and the accompanying "free"[3] GarageBand app, Goldberg's Technology Band at PS177Q is able to realize dramatic outcomes. It may seem that these technologies constitute a magical musical sword of sorts by enabling its users, but harnessing this power entails much more than simply acquiring hardware and software: "it is primarily through their *use* that technologies become musical instruments, not through their form" (Théberge 1997, 159). First, the talents and efforts of the teacher and students are due credit because while the *sounds* are emitted by machines, the *music* is produced by people who create,

arrange, rehearse, and perform it. Granted, computing devices are modern marvels of ingenuity, but just as audiences praise a *pianist's* performance as opposed to the *piano's*, so too should this mentality be extended to the computing device. In the case of both the pianist and iPadist, the instrumentalists initiate sounds by pressing keys (or buttons). Their skillfulness is manifested by *how* the buttons are pressed. Second, in addition to being a classically trained pianist and seasoned jazz performer, Goldberg has spent the past decade working with music technologies including and similar to GarageBand, all of which constitute a specialized skillset steeped in training and experience that cannot be conveniently downloaded from the App Store. There is a great deal of preparation required of Goldberg to facilitate his students' participation in the Technology Band. He evaluates music-making apps on a case-by-case basis for their potential suitability to a specific student. This process requires Goldberg not only to have an intricate understanding of each of his students' abilities, but also to customize each app in order that it enables each student's music-making. Goldberg is the "Wizards of DAWs," the person behind the figurative curtain who possesses the musical knowhow and technical facility to manipulate apps like GarageBand such that his students can *use* them as opposed to being *used* by them.

Are you using technology, or is technology using you?

> Essentially, I believe that modern technology is an instrument in the music. I am an advocate for technology as long as it's something that's used rather than something that somebody is used by. It's very easy to become a slave to technology and do something over and over again. Even though you have the ability to try a lot of options with a computer, that doesn't mean that it will be done any better or quicker. It is important that you make sure you use technology to your advantage and don't ever let yourself become used by it. (Flood 2005, 131)

Flood, the sonic architect of many critically revered and commercially successful albums that meld electronic and acoustic sounds,[4] captures the problem of the DAW double-edged sword succinctly with this statement. The *facile fallacy*—the misconception that music can be made seemingly instantaneously and effortlessly with technology—fosters a music miseducation. DAWs are often peddled under the guise of being easy to use, such as Apple boasting GarageBand as "Incredible music. In the key of easy," but this is not a marketing ploy unique to the Digital Age. For

example, America produced approximately 2.5 million player pianos from 1900–1930 and one of the major selling points of this technology was that they were lauded as easy to play (Roehl 1968). This is best exemplified by the Gulbransen Company's print ads during this era that depicted a crawling baby pressing a foot pedal with its hand, coupled with the caption, "Easy to Play." With all due respect to player piano technique and the marvel of this pneumatic technology, the genii built into its architecture were the perforated rolls "programmed" by professional composers, arrangers, and performers. The "easy" experience of the player piano was made possible by the hard work of seasoned musicians. This is an apt comparison for DAWs such as GarageBand whose marketers have built a Gulbransen-eque "easy to learn" brand:

> Today, anyone with loop-based music software on her computer can make music from ready-mades: entry-level software like GarageBand has brought loop-based musicking to the reach of almost everyone. (Väkevä 2010, 61)

Beneath the veneer of the DAW GUI (graphical user interface), there is a layer of music education woven into the code of the software that makes the "ready-made" experience possible. Programmers make assumptions and covertly steer users by limiting options, "They subliminally direct the actions of users, in both musical and non-musical ways" (Jennings 2007, 78). This is a necessity for all software dependent on a GUI; it is inevitable that some actions will be perceived as more accessible than others because they all cannot be displayed unless the program is very simple:

> Making everything visible is great when you have only twenty things. When you have twenty thousand, it only adds to the confusion. Show everything at once, and the result is chaos. Don't show everything, and then stuff gets lost. (Norman 1998, 74).

Pullin (2009) relates that in the design process, "adding complexity to achieve accessibility...may be inclusive in principle, but not in practice" (85), concluding: "sometimes it is better to deny the user a feature that could have been useful, in favor of a better overall experience" (86). Thus, software selection can also be a music-making decision:

> The outcomes of specific systems are influenced by the designer's cognitive or physical preferences and understandings. When we choose

> a piece of music software, or other technology, we are essentially deciding, in part, whether or not our priorities align with those of the designer. (Brown 2015, 17)

The DAW user lives in constant tension between the two poles of either directing or being directed by the software, and using the *conventional* terminology of affordances, constraints, and conventions to detail this experience is *constraining*. To Norman (1999), conventions and (perceived) affordances are distinct and should not be confused, nor used interchangeably, but this perspective is rooted in a distinction between the physical and virtual world. To put this in plain terms, consider a plain piece of paper and the act of writing on it. In the physical world, the inability to write outside of the dimensions of the paper's physical surface can be explained within the affordance/constraint dichotomy paradigm; either the action of writing is possible or it is not. In the virtual world using a word processor that depicts a page on screen, the same limitation is a cultural convention that can be attributed to design.

The significance of this distinction with regard to music technologies is that often the new user is not familiar with the conventions; the physical design metaphors employed by software designers often fail to provide a meaningful frame of reference for the new user. For example, a commonly used convention in DAW design is the analog mixing console metaphor, which is meaningful to those who experienced a recording studio in the analog era, but a museum piece to the millennial. To the user unfamiliar with the design metaphor of the mixing console presented to them on screen, the console is not a representation of a mixing interface—it *is* the mixing interface. Contributing to the potential confusion of the new user is the fact that some GUIs within an application are based on physical objects, often replete with skeuomorphism,[5] whereas other GUIs make no reference to physical objects because their DNA consists of ones and zeroes, not circuits and solder.

Norman's notion of "conventions" have evolved to become "perceived affordances" because increasingly the virtual domain and physical domains are indistinguishable in everyday tasks that require a computer. From the user perspective, the "conventions" *are* "perceived affordances" because they signify and guide what actions are possible. The limitation of this language is that what is

possible with a music-making program is not best described by the bifurcations of "afforded" and "constrained." There are gradients of opacity; some actions are clearly more easily afforded than others. Thus, I posit that the curriculum cloaked in the code of any music-making software can be analyzed with a five-prong approach that questions what actions are: (a) presumed, (b) privileged, (c) provided, (d) protected, and (e) prevented. These criteria are not meant to supplant the existing lexicon pertaining to affordances but rather to supplement it. To explain each phenomenon, I will illustrate using examples navigating the music-making experience in GarageBand.[6]

Presumptions

The DAW is no exception to the fact that all musical instruments presume that specific conditions must exist in order for it to be played. Acclimating to a DAW environment requires the user to be adept with the hardware it is hosted on. From approximately 2000–2010 (the span of time when DAWs first became widely available to the home computer owner until the advent of the iPad), a desktop or laptop computer was required to use a DAW. Therefore, anyone wishing to learn how to use a DAW during this period had to possess or acquire a level of computer literacy sufficient to operate a DAW. Computer-general actions and prompts such as clicking, dragging, copying, pasting, cutting, undoing, and so forth are music-making actions in the DAW domain typically learned previously from other computer-dependent tasks. This is likely a safe assumption for the digital natives living in technologically-rich circumstances who "approach learning as a plug-and-play experience" (Black 2010, 99), but it marginalizes those who do not have access to the technology and those unaccustomed to a trial-and-error approach to learning: "Our expectations and assumptions about how interfaces work is a form of knowledge that not everybody has" (Eric Rosenbaum, personal communication, January 8, 2015).

Beyond general computing skills, there are platform-specific skills that need to be learned or temporarily unlearned to successfully navigate an alternative operating system. Personal computer users often identify as being either a "Mac person" or "PC person," and there are conventions to these differing operating systems that will ultimately have an impact on how music is made. GarageBand is a

proprietary program of Apple and therefore not available for PC users. Anyone wanting to make music with GarageBand must be able to navigate an Apple operating system.

The iPad's release in 2010 inaugurated a new era for music production ushering in the mobile audio workstation (MAW). The MAW mostly preserved the DAW software concept, but completely upended the established practices of music-making with the QWERTY keyboard and mouse by replacing them with touchscreen gestures. Akin to the DAW, the MAW presumes the user is able to perform a set of hardware-specific gestures to explore different areas of the graphical interface to evaluate consequences. Just as general personal computer actions such as mouse clicking can be musical in the DAW domain, so too can the general purpose tablet actions of tapping, swiping, and tilting become musical in the MAW domain. The great advantage of this reality for the music educator is that these nuanced fine-motor control actions are often learned prior using other frequently utilized applications. The sword slices both ways; if learners have computer experience, they already possess half the skills needed to play the DAW or MAW, but if they do not, the learning curve is much steeper.

Privileges

Computer programs privilege some actions over others by making them easier to do. Other actions are possible, but the software designers have created a framework in which the user is encouraged by design to carry out certain actions. While there are many possibilities provided by the DAW, privileged actions follow the path of least resistance. Upon launching GarageBand, three overarching options are presented to the user: "New Project," "Learn to Play," and "Lesson Store." While the "Learn to Play" and "Lesson Store" options are deserving of discussion within the music education community because they explicitly frame the corporation as educator, this discussion will be delimited to creating projects within GarageBand. Creating a project within GarageBand commences the process of composing a piece of music subscribing to the paradigm of "songwriting" and "recording" as parallel processes. This concept is a central tenant of Zak's *Poetics of Rock* (2001). In Zak's view, a song, its arrangement, and recording are not necessarily distinguishable entities. Calling it

"commonplace" in "pop music production," Zak (2001) reasons that "recordings assert their own versions of acoustic reality...through a process of creative distortion of real-world musical events" (308). Pink Floyd producer, Andy Jackson, summarized this phenomenon succinctly: "On a great track it can be hard to differentiate between production, engineering, and arrangement, they are so symbiotic in terms of the way the track works its magic on you" (as cited in Burgess 2005, 187). The musics that GarageBand privileges (i.e., rock, hip hop, and electronica) have evolved in an era in which willful mediation by the recording process is the norm.

Following the decision to create a new project, the closest option to a blank page is the "Empty Project," but even it comes prepackaged with constraints. Immediately after making this selection, GarageBand dictates that choosing an instrument should be the first step, forcing the user to opt for a software instrument, "drummer," or to record audio using a microphone, guitar, or bass (Figure 1).

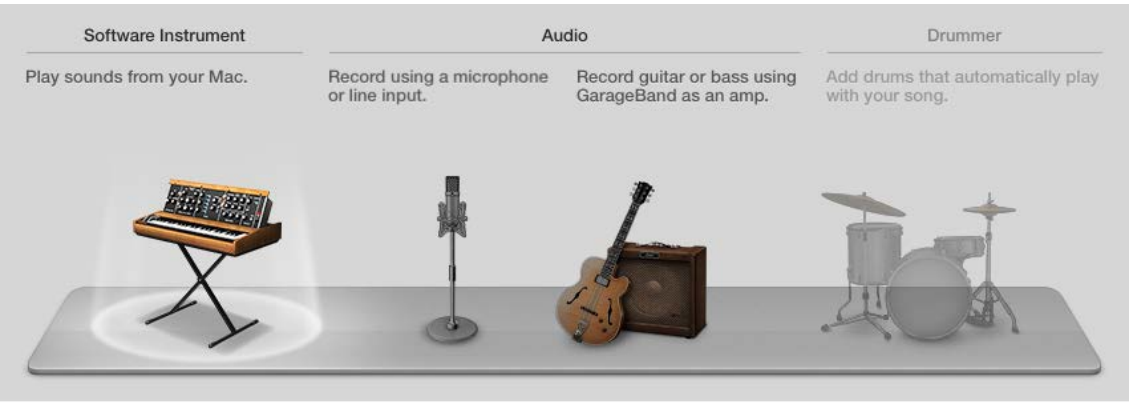

Figure 1. GarageBand privileges rock instrumentation

Visually, GarageBand suggests the user adopt the instrumentation of the archetypal rock band: vocals, guitar, bass, and drums. In the realm of GarageBand the starting point for a song is in the key of C major at 120 bpm in 4/4. Users who select a more prescriptive template such as "Hip Hop" or "Electronic" are subjected to more "suggestions." The hip hop template is preset to 75 bpm with instrumentation consisting of a drum machine, string ensemble, piano, and four synthesizers. By default, the "loop window" is open when the hip hop template is selected, encouraging users to drag and drop pre-composed loops into their compositions:

> GarageBand does not facilitate composition at the micro-level: instead the user is invited to manipulate pre-existing loops of material, chaining them together to make new music from relatively large and undigested segments, to reform rather than to transform. (Blake 2010, 55)

While looping is privileged in the "hip hop" and "electronic" templates, the "songwriter" template is coupled with a virtual drummer named "Kyle" and two pre-programmed 16-bar beats, respectively labeled "Half-pipe" and "Mixtape." Other "rock" drummers may be selected such as the handle-bar-mustached "Logan" or the Mohawk-sporting Max whose name is spelled with an anarchist "A." The non-white drummers such as "Rose," "Curtis," and "Benny" can be found under the "R&B" tab (Figure 2).

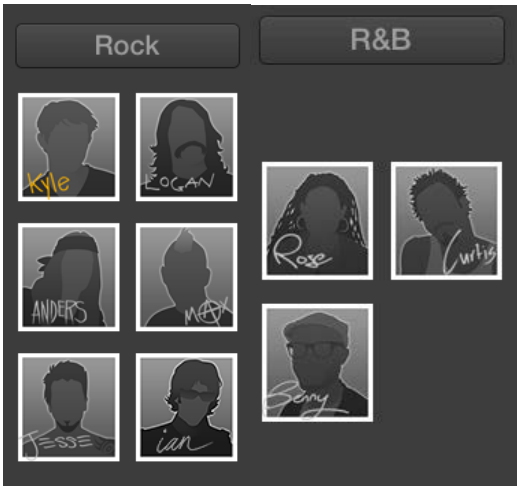

Figure 2. The GarageBand drummers

GarageBand reinforces racial stereotypes reminiscent of the segregation-era label "race records" by associating musical styles with melanin. The caricatured drummers are symptomatic of the music the user is led to make. Users of the same software are guided to compose in a generic method, resulting in generic outcomes where the software itself becomes the genre. Privileges are the default settings and presets in a program. Inexperienced users are the most vulnerable to being used by them because they do not recognize these privileges. Defaults and presets are not inherently good or bad, they just *are*, and unless you can write your own computer program they are necessary in every music-making computer program. Recognizing

and navigating what is privileged is the first step to avoid falling into the trap of software-dictated musical genericism.

Provisions

When software steers the user towards an action it is *privileging*, but there are other actions possible that are not as immediately intuitive to the inexperienced user that are *provided*. These potential actions lie waiting to be discovered with an exploratory click or tap, but are not explicitly endorsed with a pop-up window or preprogrammed in a preset template, as is the case with a privilege. The experienced DAW user is in the best position to evaluate what a particular program privileges and provisions based on experiences navigating other DAWs.[7] There are features common to most DAWs that users come to expect. Latartara (2011) identifies two provisions:

> Repeating and looping sounds is one of the most common compositional techniques coded within music software programs today...Repeating loops are intrinsic to the software interface...The second is the ability to layer these repeating loops one on top of another. Sequencers and digital audio workstations (DAWs) provide an easy visual format for layering different sounds or tracks and mixing them together. (110)

Most provisions can be found in the menu bar splayed across the top of the screen, a convention of almost all software programs, but the graphical interface design often provides a shortcut in the form of a clickable icon that produces the same result. GarageBand adheres to these conventions by providing both paths to opening the looping window. To utilize one of the 2-bar loops from the seemingly endless supply categorized according to instrument, genre, and mood, the user is expected to know that the sound is dragged onto a track. Once this action is performed, the 2-bar block can be moved to a desired position in the piece and looped to any length.

This approach to music composition is derived from the hip hop tradition commencing in the early 1970s when DJs sifted through records to find instrumental "breaks" for b-boys to dance to and MCs to rap over. DJ Kool Herc famously soaked the labels off of his vinyl records to prevent his competitors from learning his trade secret source material. In GarageBand the samples are pre-supplied, promoting a cookie cutter approach to production in which pre-fabricated blocks of sound are

combined and/or stacked in assembly line fashion to manufacture music. The embarrassment of riches that GarageBand provides with a vast loop library poses a problem, as the inexperienced loop-based music-maker is often reminiscent of the inexperienced baker. Given a bounty of ingredients, the inexperienced baker has a tendency to select everything that is appetizing, failing to anticipate how the ingredients will taste together. Similarly, accumulating loops with abandon tends to create a cacophony of competing motifs. Just because a tool is available does not mean that it needs to be used.

Protections

Protections are the capabilities of a program that are hidden from the user. There are no prompts or inviting icons to guide the actions of the user. This is information that must be passed on from a peer, internet search, or stumbled upon through trial and error. For example, GarageBand has a piano roll, which has been the established convention of writing and editing MIDI data in a sequencer since the late 1980s. The piano roll presents notes as rectangular blocks on a grid with a piano keyboard spanning the vertical axis to indicate pitch, and the horizontal axis representing the duration of time in bars, beats, and divisions, or seconds, with vertical line indicators (Figure 3).

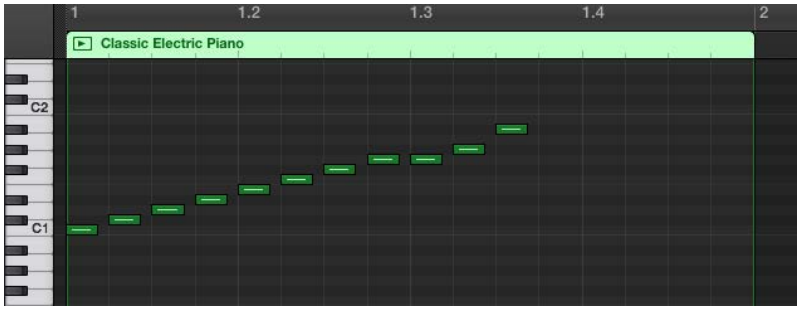

Figure 3. The piano roll editor view in GarageBand

GarageBand also has a traditional score editor in which notes can be dragged up and down to change the pitch and left to right to change duration (Figure 4).

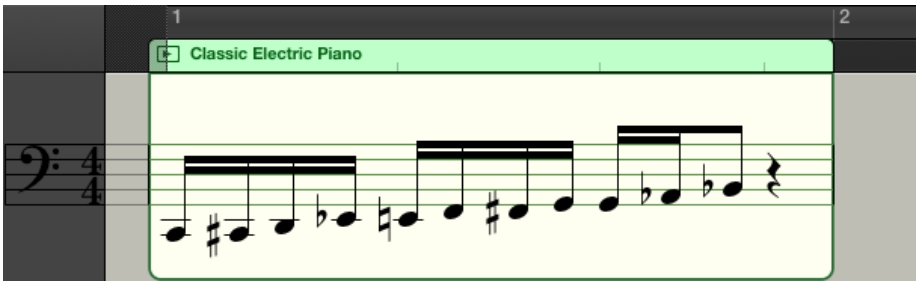

Figure 4. The score editor view in GarageBand

In both cases, these tools can be used to write music into GarageBand without first recording it, but this is a protected feature. There is no indication anywhere on the screen that presents this as an option; it is made available through a learned key command. Writing music in this manner is not necessarily more advanced than recording-as-writing, but the software shields this approach from the user. For the inexperienced user, protections are paradoxical, as they cannot know what they do not know. Without the help of a more experienced user, protections tend to stay buried unless the user finds them through exploration.

Preventions

Lastly, preventions, akin to "anti-affordances" (Norman 2013), are simply those actions that the DAW does not permit. While it may seem arbitrary and even unfair to expect a program to support a particular action, it must be referenced to the other programs it competes with. Therefore, GarageBand can be compared to other DAWs to examine its deficiencies. This way of thinking is what spurs technological innovation. By realizing the limitations of music-making technologies, we imagine new possibilities. Sometimes imagination cannot wait for updates, leading musicians to repeat the cycle of investigating the musical possibilities of other applications not typically associated with music-making. Recently, Rogers (2013) and Ruthmann (2013) have discussed the phenomenon of video-based songs, which pits the video editor as DAW. Video is typically edited in seconds or frames, but musicians have derived a community of practice to co-opt the practice of video editing as music composition. The inexperienced DAW user should be encouraged to imagine the possibilities beyond what the software affords.

Conclusions

The iPad version of GarageBand is promoted with the tagline, "If you can tap, you can play," an adaptation of the Zimbabwean proverb, "If you can walk, you can dance. If you can talk, you can sing." Proverbs exist because they have repeatedly rung true and resonated within a culture. I grew up in rural Canada where ice hockey is like religion and the oft-repeated phrase; "Keep your stick on the ice" has attained proverbial status because the odds of scoring a goal are much greater when you heed this wisdom. DAWS and MAWs have yet to transcend a generation and thus far the hardware that hosts these applications has changed at such a rapid rate that, "If you can tap, you can play" is a message to receive with caution.

The capabilities of the DAW continue to expand in tandem with the processing abilities of the electronic devices that host them and their affordances will evolve in parallel. As human imagination produces new features, new learning will be required to harness these features. Software designers will continue to influence the music education of our computer-wielding society. While music-making hardware and software will undoubtedly continue to be characterized by constant change, the principles of presumptions, privileges, provisions, protections, and preventions will be applicable to the technological innovations that stem from our imaginations.

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Notes

[1] He-Man's twin sister, *She-Ra: Princess of Power*, was marketed for girls. I watched both.

[2] Regelski's definition of what constitutes a "musical dimwit" is unclear.

[3] The iPad version of GarageBand is a free download, but it encourages in-app purchase to unlock its full capacities.

[4] Flood has recorded or produced U2, Depeche Mode, New Order, Nine Inch Nails, Erasure, Ministry, The Smashing Pumpkins, and The Killers.

[5] "Skeuomorph is a term anthropologists use for a device that once had a functional purpose but in a successor artifact loses its functionality and is retained as a design motif or decorative element." (Hayles 2002, 119)

[6] This analysis is based on GarageBand for Mac, which has many similarities to the iOS version (for iPhone and iPad), but also has some key differences.

[7] My analysis of GarageBand is based on my experiences using twelve other DAWs, MAWs, and OAWs (online audio workstations) over the course of fifteen years: Data Becker Music Center, Sonic Foundry/Sony Acid, Fruity Loops/FL Studio, Adobe Audition, Audacity, Cubase, Pro Tools, Logic, Auria, Ableton Live, Reaper, and Soundation.

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