

Chapter 2

Getting on the Billboard Charts: Music Production as Agile Software Development

Newton Lee

Computers and music are converging in a new era of digital Renaissance as more and more musicians such as will.i.am are learning how to code while an increasing number of software programmers are learning how to play music.

2.1 Music Appreciation and Songwriting

I dabbled with music composition before I learned computer programming. When I was in high school, one of my best friends, Kai Ton Chau, and I would go to the Hong Kong Arts Centre on the weekends and listened to hours of classical music. My appreciation of music grew from passive listening to active songwriting. For the high school yearbook, Chau and I decided to write a song together. Inspired by Rodgers and Hammerstein, he composed the music and I wrote the lyrics. The resulting sheet music was published in the yearbook.

Although I majored in electrical engineering and computer science during college years, my songwriting hobby did not dwindle over time. On the contrary, as soon as I landed my first full-time job at AT&T Bell Laboratories, I bought a professional Roland synthesizer and hooked it up to a Macintosh SE computer loaded with all the best music composition software at the time. I would write melodies and my vocal teacher Josephine Clayton would arrange the music.

As the founding president of Bell Labs' *Star Trek* in the Twentieth Century Club, I produced the first-ever "Intergalactic Music Festival" to showcase international songs and cultural dances performed by fellow AT&T employees. Indeed, music abounds in the *Star Trek* universe: Leonard Nimoy wrote and performed the song "Maiden Wine" in the original *Star Trek* episode "Plato's Stepchildren," and he

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Fig. 2.1 The Disney Online “Love Crew”: Mark Andrade, Bob Wyar, Michael Borys, Michael Bruza, Carrie Pittman, Cathy Georges, Frank Avelar, Gwen Girty, Eric Huff, Katie Main, Keir Serrie, Kenneth Ng, Mina Oh, Newton Lee, Pamela Bonnell, Robin Levey, and Elizabeth Swingle

played various musical instruments in “Charlie X,” “The Way to Eden,” and “Requiem For Methuselah” (Maiden Wine 2013).

Nimoy portrayed science officer Spock on board the *U.S.S. Enterprise*, who took pride in his emotionally detached, logical perspective. Yet, Spock displayed more musical talent than his crewmates. In reality, I have personally known many talented software engineers who are themselves gifted musicians: Henry Flurry, Harold Cicada Brokaw, Mark Tuomenoksa, Stephanie Wukovitz, and Jesse Gilbert, just to name a few.

Henry Flurry and Harold Cicada Brokaw are both award-winning music composers and software developers who worked with me on creating some of the bestselling Disney CD-ROM titles including *The Lion King Animated Storybook*, *Winnie the Pooh and the Honey Tree*, *Pocahontas*, *The Hunchback of Notre Dame*, and *101 Dalmatians* (Flurry 2010). Flurry, Brokaw, and I shared the 1995 Michigan Leading Edge Technology Award for creating Callisto—an innovative graphical authoring tool for multimedia CD-ROM software development.

Mark Tuomenoksa supervised me at AT&T Bell Laboratories on reverse engineering the Mac OS System 4.1 on the Apple Macintosh SE in the late 80’s. Today, Tuomenoksa “spends his days developing everything from embedded algorithms for implantable medical devices to web platforms for autism research to IOS and Android applications that integrate biometric, environmental and observational monitoring. At night, Mark plays music, performing with bands at clubs and festivals, composing soundtracks and jingles, and playing sessions” (Tuomenoksa 2014).

Stephanie Wukovitz worked for me at Disney Online where she developed Java software code as well as composed background music for over 40 popular online games that were featured on Disney.com and the now-defunct DisneyBlast.com. We received many positive feedbacks from online players about the games as well as the music (Lee and Madej 2012). To celebrate the first anniversary of DisneyBlast.com in 1998, the Disney Online “Love Crew” wrote and recorded the song “Keep the Love Online,” and I was chosen to be the lead rapper for the E. Huff and Puff Newton remix (Huff and Lee 2012) (see Fig. 2.1).

Jesse Gilbert is the chair of media technology at Woodbury University's School of Media, Culture, and Design. In 1994, Gilbert received a Watson Fellowship and spent a year studying music in Ghana, West Africa. His fascination with sound representation for tribal music and later heavy metal music led him to the development of SpectralGL—a visual instrument that employs an interactive software system to generate real-time 3D animation in response to live or recorded sound. Employing a number of computational analytical tools, including Fourier analysis and oscilloscope-style waveform deformation, SpectralGL reveals the deep structure of sound in a visual language that is both intuitively and aesthetically linked to our emotional experience of music. SpectralGL's interface gives the performer the means to generate highly dynamic 3D scenes that place the observer in a visual relationship that both enhances and reflects on the process of listening. In addition, SpectralGL's ability to overlay digital media onto its 3D surface expands upon traditional notions of presentation of the moving image, and of the relationship between sound and image (Gilbert 2013).

2.2 Relationship between Music and Computer Programming

What is the relationship between music and computer programming? Rob Birdwell explains in his blog dated November 2003, the same month of my Quincy Jones interview (Birdwell 2003):

- Creating music and software are simultaneously collaborative and individualistic undertakings.
- Musicians (regardless of era) are generally technically engaged - instruments themselves (the hardware) often interface with other devices (amps, mixers, mutes) to achieve different sounds. Composers often deal with an array of technologies to get their music written, performed and/or produced.
- Music is an abstract medium—the printed note requires interpretation and execution. Like the written line of code, there is often much more than meets the eye.
- Music is a form of self-expression. Many programmers (often to the dismay of corporate managers) try to express themselves through code.
- One famous music educator, Dick Grove, once said that composers/musicians often like to solve puzzles. (Dick Grove was very computer savvy - although I'm not sure he wrote code, I wouldn't doubt his ability to do so.)
- There is an infinite variety in music, musical ideas, and styles. Programmers are faced with a vast array of tools, concepts and languages for expressing and translating these ideas into something that achieves yet another result.

“Instrumentalists in particular (guitar players for example) make great programmers,” Carl Franklin comments on Birdwell's blog. “It's not just about math and music being similar, or the fundamentals vs. the art. Instrumentalists have to zoom

in to work with very repetitive technical details, and so become very focused—like a guitar player practicing a piece of music at a slow speed. But, the best programmers are able to then zoom out and see the big picture, and where their coding fits into the whole project, much like an artist has to step back from a painting and see the whole of it, or an instrumentalists has to produce something that communicates a complete work, not just the scales and technical aspects of it.”

Nearly 10 years later in 2013, Birdwell wrote an update on his website (Birdwell 2013): “Both music and programming involve creating something from a very abstract concept or inspiration. Where programming and technology can be wondrous and grand (involving everything from a simple web site to collecting data from distant galaxies) so too can music. Both involve a ‘commerce’ aspect (i.e., commercial music, commercial software)—and yet both can be approached purely artistically. Both can be deeply personal and expressive.”

Liz Ryan, CEO and founder of Human Workplace, opines that “Musical kids are smarter than most. They could major in anything—yet they choose music. If the kid decides to switch to biochemistry in mid-stream, I promise you, the kid will not fail. Music kids outscore all other majors in grad-school entrance exams. Why not let a kid with options pursue his musical dreams as far as that journey will take him? There’s no downside” (Ryan 2013).

Given the intricate relationship between music and computer science, musical education can be useful for computer programmers, and software development is vice versa beneficial to musicians. This book presents the work of many researchers who wear at least two hats: a computer scientist and a musician. It shows how computer science has enabled practitioners to accomplish more than ever in the field of music.

A strong supporter of science, technology, engineering, and mathematics programs in schools, The Black Eyed Peas founding member will.i.am announced in July 2013 his future plan to attend the Massachusetts Institute of Technology to study computer science (McMohan 2013).

2.3 Computers and Music in the Digital Age

In 1961, an IBM 704 became the first computer to sing (Bell Laboratories 2008). According to U.S. Library of Congress, “This recording [“*Daisy Bell (Bicycle Built for Two)*”], made at Bell Laboratories on an IBM 704 mainframe computer, is the earliest known recording of a computer-synthesized voice singing a song. The recording was created by John L. Kelly, Jr., and featured musical accompaniment written by Max Mathews. Arthur C. Clarke, who witnessed a demonstration of the piece while visiting friend and Bell Laboratories employee John Pierce, was so impressed that he incorporated it in the novel and film script for ‘*2001: A Space Odyssey*.’ When Clarke’s fictional HAL 9000 computer is being involuntarily disconnected near the end of the story, it sings “Daisy Bell” as it devolves” (Library of Congress 2010).

The previous chapter “A Tale of Four Moguls: Interviews with Quincy Jones, Karlheinz Brandenburg, Tom Silverman, and Jay L. Cooper” chronicled the advancement of music technology since the forties, from stereo headphones to the Fender bass to synthesizers to DVD to the Internet. Music changes every step of the way as technology advances.

I remember listening to the radio in the eighties. Unlike the weekly Casey Kasem’s Top 40 countdown, the radio DJs sometimes did not announce the names of the songs that they were playing. Therefore I had to use a cassette tape recorder to record bits and pieces of the songs that I like, play them back to the salespersons at some record stores who could help me identify the songs, and then purchase the singles or the entire albums on Vinyl or CD.

Computer hardware and software for music have improved drastically since. Shazam, SoundHound, musiXmatch, and Google Ears (Sound Search) are some of the mobile apps that can name that tune for you (Kelapure 2013). On iTunes, Google Play, and Amazon mp3, we can buy a single song without purchasing the entire album, and instantly without driving to a record store.

New musical instruments are being conceived and developed that will spawn new ideas and musical genres. The Artiphon, for example, is a multi-instrument (guitar, mandolin, bass, violin, and lap steel) powered by an iPhone or iPod Touch. “I wanted to make something that people at all skill levels could play, a device as agnostic to musical style as the piano but as expressive as a violin,” said Mike Butera, inventor of the Artiphon (McNicoll 2013).

As for songwriting, today’s composers fully embrace the latest computer technology in music production. In the chapter “Delegating Creativity” in this book, Prof. Shlomo Dubnov and Greg Surges wrote that “composers have increasingly allowed portions of their musical decision-making to be controlled according to processes and algorithms.” In fact, computers and music are converging in a new era of digital Renaissance as more and more musicians such as will.i.am are learning how to code while an increasing number of software programmers are learning how to play music.

This book, in particular, holds dear to my heart because I have experienced firsthand as an executive producer overseeing the complete process of music production: from songwriting to recording to promotion. In 2011, four of the songs that I executive produced were aired on primetime TV (FOX and Lifetime). In 2013, one of the songs was charted on the U.S. Billboard Top 15 and U.K. Music Week Top 10.

2.4 Music Production (Software Development) Life Cycle

The Beatles producer George Martin once said, “A record producer is responsible for the sound ‘shape’ of what comes out. In many ways, he’s the designer—not in the sense of creating the actual work itself, but he stages the show and presents it to the world. It’s his taste that makes it what it is—good or bad.” Oftentimes the right chemistry between recording artists and music producers is how hit songs are made.

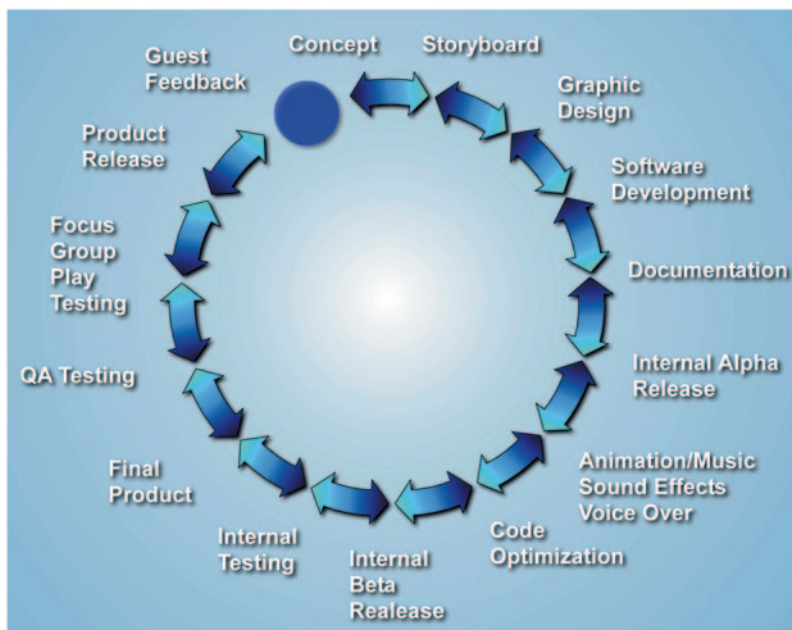


Fig. 2.2 Agile software development based on iterative and incremental life cycle

Indeed, M. Nyssim Lefford expounds producing and its effect on vocal recordings in the following chapter of this book.

While a music producer's job is to oversee the production process from start to finish, I as an executive producer put together a production team, manage the budget, lay out the timeline, and give the final approval of the musical products. The combined creativity of my team—consisted of music producers, songwriters, and performers—is evident in the music that we create. Since 2009, I have worked with many award-winning composers, producers, directors, and musicians who have their own different persona and creative styles. The challenge is to create a melting pot conducive to creativity in spite of their differences.

In every step of the music production, I manage the process according to agile software development based on iterative and incremental life cycle (see Fig. 2.2) while keeping in mind that making changes to a song or music video during its development cycle can be limited or cost-prohibitive.

2.4.1 Music Genre (Concept)

The first step is to decide on the genre of music, be it pop, dance, jazz, country, hip-hop/rap, R&B/soul, rock, alternative, or crossover music. The music genre determines who will be considered to join the creative team. In pop music, I have worked with Inessa Lee and Allyson Newman on “Write Me,” “Remember Me,” “Play with

Me,” “Take Me to the Moon,” and “Insane in F#.” In pop-rap, I have collaborated with Ievgenii Bardachenko (JayB), Sjors Klaassen (DJ RMFH), and Princess X on “Summertime.” In dance-pop, I have executively produced “You Turn Me On” with Mike Burns, Jonathan Reyes, and Princess X; “Gimme All (Ring My Bell)” and “Free” with L.C. Gonzalez, Tony Haris, Heidi Rojas, and Princess X; and “Dynamite” / “Динамит” with Liza Fox, Ana Sîrbu, and Radu Sîrbu.

2.4.2 Song Idea (Storyboard)

Is it an up-beat song or a sad song? Is it about love or a charitable cause? Such questions are raised in the brainstorming sessions. Inspiration is the most important ingredient at this stage. For example, British musician Jerry Dammers wrote the song “Free Nelson Mandela” (1984) that became the anti-apartheid anthem (Simpson 2013). Released on July 4, 2013, the new single “Free” was inspired by civil rights activist Martin Luther King, Jr., and the song contained samples licensed from the 1991 classic “Everybody’s Free (To Feel Good)” (16).

2.4.3 Singer Image (Graphic Design)

What kind of image will the singer project with the song? A light and carefree image or a dark and sophisticated image? The performers and the producers have the biggest input into the singer image. The image will also influence the look and feel of the music video that will be created for the song. For instance, the Betty Boop image greatly influenced Helen Kane’s signature song “I Wanna Be Loved by You” in 1928.

2.4.4 Songwriting: Melody, Lyrics, Arrangements (Software Development)

Having chosen the music genre, come up with a song idea, and visualized the singer image, it is time to start writing the song. Many singers are also songwriters who actively participate in the songwriting sessions. I have attended many creative sessions where producers, singers (including background vocalists), songwriters, and I have all contributed to the melody and lyrics of a new song. There are two common strategies in composing a new song: Start with a melody and add an arrangement, or start with an arrangement and come up with a melody.

2.4.5 Songwriting Documentary (Documentation)

During the entire creative process, we compare notes, record bits and pieces of melody, discusses other existing songs, take pictures, et al. The information can easily be turned into a documentary.

2.4.6 Initial Draft (Internal Alpha Release)

The initial draft of the song is completed at this stage. A temporary vocal track may be added to it. The creative team listens to the initial draft and suggests changes to the melody, lyrics, and instrumentals.

2.4.7 Tracking: Recording Session (Animation/Music, Sound Effects, Voice Over)

Once the creative team is satisfied with the first complete draft, we would record the singers and background vocalists at a professional studio such as Peermusic in Burbank, Paramount Recording Studios in Hollywood, and The Invisible Studios in West Hollywood. Melodies, harmonies, overdubs, background vocals, and live instrumentals (if necessary) are meticulously recorded. Akin to filmmaking, music producers act like directors, and singers perform as if they were actors. Recording live performances over and over, the team aims to perfect each “take”, record the best sonic quality possible, and experiment with some variations on different takes.

2.4.8 Mixing (Code Optimization)

Now that we have all the recorded sounds, it is time to blend the arrangement and the multiple recorded elements together into a final recording that is most appealing to listeners. Mixing controls what is coming out of the end listener’s speakers: Bass becomes floor shaking, kicks begin to hit you in the chest, and vocals soar with shimmering reverb and echoes. The music producer and sound engineer often use equalizers, compressors, faders, reverbs, echoes, ear candies, and auto-tune to add space, depth, and color to the sound. Cher’s 1998 hit song “Believe” was the first major commercial success featuring the extensive use of auto-tune (Frere-Jones 2008). R&B singer T-Pain and many pop artists have further popularized auto-tune for both pitch corrections and special effects.

2.4.9 Final Draft (Internal Beta Release)

The final draft of the song contains all the elements of the vocals, instrumentals, and ear candies. Unless the creative team is completely satisfied with it, we may demand additional fine-tuning or even a second follow-up recording session if necessary.

2.4.10 Remixes (Internal Testing)

During this internal testing period, the multi-track stems including vocals and instrumentals are sent to additional producers and DJs who would remix the song into other music formats such as dubstep, progressive house, techno, and extended play for dance clubs. Remixes are a very common tool for dance music artists to gain a bigger audience worldwide. Multiple remixes playing simultaneously also helps push a song up the Billboard charts. I have collaborated with the Almighty, Mark Picchiotti, Ralphi Rosario, and the Hoxton Whores (Kevin Andrews and Gary Dedman) on the remixes for “Gimme All (Ring My Bell);” and Jason Donnelly (DJ Puzzle), Sven Erler, Daniel Gardner (DMG), Håkan Hannu, Nyx1, Joe Rare, Ilonka Rudolph, and James Sharman (Grixis) on the remixes for “You Turn Me On.”

2.4.11 Audio Mastering (Final Product)

With a minimum of 3 to 6 dB of available headroom, the final song and remixes are sent to mastering engineers who would apply corrective equalization and dynamic enhancement in order to optimize the sound on all playback systems. To master an album consisting of multiple songs, mastering engineers would re-balance each song to create a cohesive sound for the entire album. It is important to have an acoustically-treated and sound-proofed environment for superior listening. Universal Mastering Studios, a division of Universal Music Group, is one of the popular places for audio mastering. Grammy award winning engineer Erick Labson, for instance, mastered Liza Fox’s “Dynamite” / “Динамит” to give the song more oomph.

2.4.12 Variations of a Mastered Song (QA Testing)

There are times when the mastering engineers would give us a few variations of the mastered song to consider (for example, warmer versus brighter versions). The creative team would choose the best mastered version as the final product.

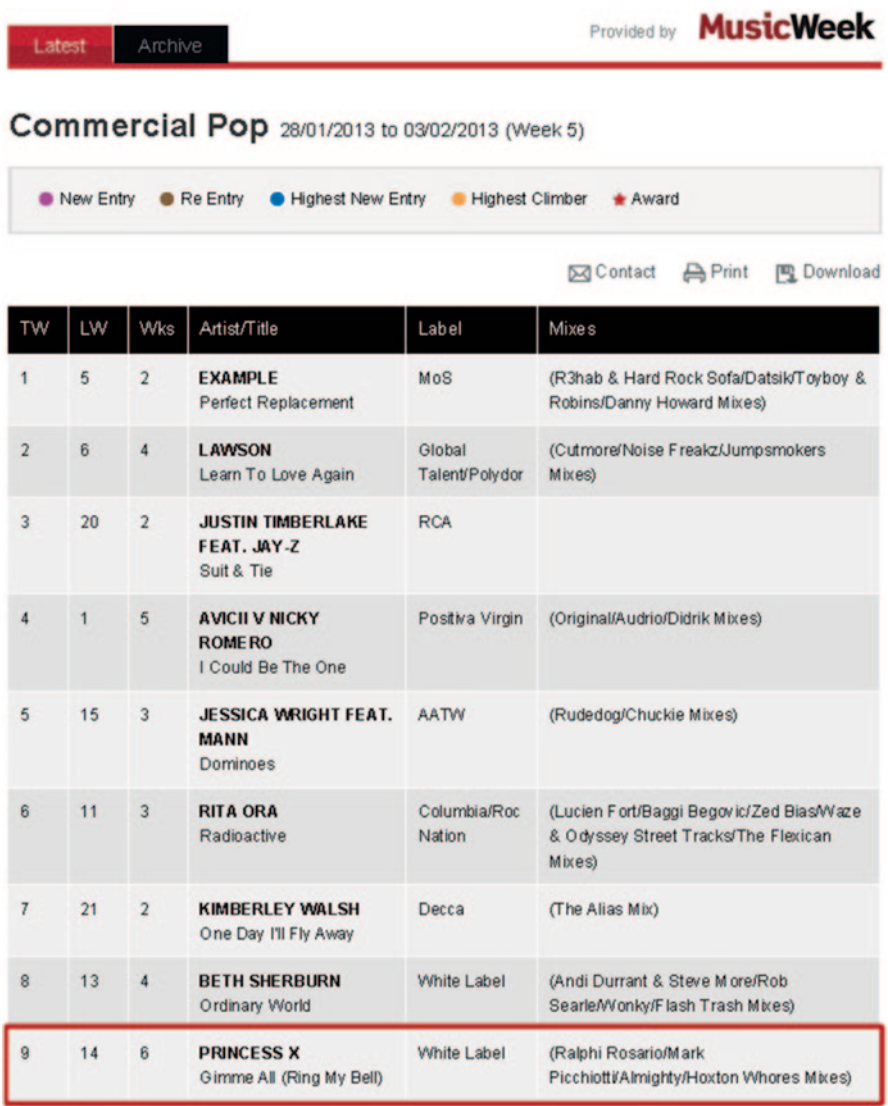


Fig. 2.3 U.K. Music Week commercial pop chart (January 28–February 3, 2013)

2.4.13 Feedback from Professionals and DJs (Focus Group Play Testing)

At our discretion, we may send out the song and its remixes to our close friends, DJs, and promoters for their feedback. At this point, we may work on a music video for the synchronous release of the song. A music video director interprets the song



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Digital Da Vinci

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