Intellectual Property and

Mobile Apps in Music: A Guide

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1 There's an app for that

In 2009, Apple promoted its iPhone with this slogan. Their slogan passed into the language and the use of smartphones – from Apple and its competitors – has become commonplace around the world. The applications, or apps, that run on these smartphones are the way in which many of us interact with services, information and each other.

Since computers were invented, people have written programs that run on them and do useful things. These became known as applications because the computer was being applied to a particular task. It was natural that when a new form factor of computer – the mobile phone – became available, the programs that ran on them would also be known as applications. These mobile phone programs are what we understand as apps, with their big brothers remaining as applications.

This guide focuses on apps and the way they are used (and sometimes misused) in creating music. It covers all aspects of the creation and distribution process, drawing on catalogs of available software (app stores), user reviews and the opinions of industry experts.

As well as providing general advice, this guide will focus on the intellectual property (IP) aspects of using apps in music creation. There are numerous connections between IP and apps. These relate to the app itself, the materials used as input in the music creation process and the outputs intended for listening. IP issues play a massive role in the economics of music creation and drive the sustainability of both the app ecosystem and the music ecosystem.

Given it is such a universal tool, much of the discussion will relate to the phone. Apps do not run exclusively on phones though. The tablet is to some extent just an overgrown phone

and often runs the same software (on a bigger screen), but apps can also run on televisions and devices that plug into them, and on in-car entertainment systems. Where there is a difference in the way they are used for music, this will be highlighted, but otherwise they can be assumed to work in much the same way.

Many apps can be downloaded from an app store. These make downloading straightforward for those without specialist knowledge. App stores are not the only way to get software on devices but they are certainly convenient and go a long way to ensuring security and compliance.

Box 1 **The other operating systems**

This guide will focus on Apple's iPhone and its iOS software, and the Android operating system. There have been many earlier systems with an app ecosystem, but these have mostly disappeared in the face of competition from iOS and Android. Earlier operating systems (now largely of interest only to historians) include Windows 10 Mobile (and its predecessors Windows Mobile and Windows Phone), Nokia's Symbian, Palm OS and Blackberry OS.

Apple's iPads run a different operating system called iPadOS, which, while not quite the same as iOS, is sufficiently similar that developers can write apps for both without much difficulty.

WebOS is in active use but mostly on televisions, and ChromeOS is used on notebooks called Chromebooks, though some look very much like tablets (and generally work with Android apps anyway). Neither will be covered in this guide.

All the examples presented here are just that – examples. There are usually multiple apps for something, and it is not the intention to recommend a single preferred choice. Many online sites list the alternatives available for a given task, and they are likely to be more up-to-date. The purpose of this guide is to highlight opportunities, and a user will likely find there are many options. Often free trial versions of apps are available, and checking these out may reveal an alternative that not only works well, but also matches a user's preferred way of working.

2 Music and apps

This guide covers a range of ways in which apps can be used to create music. These include the following steps in the music creation process:

- **Songwriting** – composing the song or other work, alone or in collaboration with others,
- **Publishing** – making the song available to others so they can record it, or at least license it for performance,
- **Recording** – recording a performance of the song,
- **Synthesis** – setting up electronic synthesisers to create musical sounds, possibly based on actual captured sounds,
- **Mixing** – balancing the recorded elements so they complement each other,
- **Mastering** – final tweaking of the mixed recording to sound as good as possible,
- **Registration** – making sure that everyone with a need to know about the new recording has authentic information about it,
- **Distribution** – sending the finished recording to the platforms where people can listen to it,

- **Marketing** – creating interest in the recording on traditional and social media, and
- **Documentation** – keeping good records of what went on in the creationprocess so the correct people get credited and paid, and reuse of the recording in future is possible.

Each area can use an app to make music creation easier, faster or richer, though there is no obligation. Old-school methods will work better for some people, and they should not hesitate to use them. But they might perhaps ask themselves whether this is best in the long term. Will it be easier to send lyrics to a publisher if they are written on a napkin or word-processed in a file on a device? The choice is with the user.

It should be noted that some of the best music apps have been developed by musicians. Familiarity with artists' needs in the various sectors puts them in a good position to either program apps themselves if they have or can acquire the skills, or to work with developers to design apps and guide their functionality.

Box 2 **Case study: Jordan Rudess**

Jordan Rudess: © Henning Ihmels, CC-BY 2.5

https://commons.wikimedia.org/w/index.php?curid=131318088

Jordan Rudess plays keyboard for progressive metal band Dream Theater but he also has a software company, Wizdom Music, which publishes apps for the iPhone and iPad. These include GeoShred, a specialized keyboard and synthesizer, and HarmonyWiz, which arranges chords for a melody.

GeoShred: Source: Wizdom Music.

3 App issues

This guide is about music but some issues are common to all apps and their use.

3.1 Compatible?

Not all apps will be as compatible as users might like. Clearly, apps must be written for their intended platform. An Apple iPhone is not intended to run an Android app, and vice versa. Many apps are written for both iOS and Android, but these are very different environments and two different teams of experts can be required to create the different software, and keep the versions compatible and in sync. Development systems creating apps with the same functionality on both platforms are available, but their users sometimes consider the results to be an uneasy compromise.

Because of this cost, some developers write for one platform or the other, and users of the 'wrong' platform are out of luck. Sometimes a successful app will be transferred (ported) to the other platform, though this is rare as the software initially created will use capabilities not available elsewhere.

In particular, it is easier for writers of open-source software to use the Android platform. The rules put in place by Apple to protect users from malicious code can make it hard for free software to be made available on that system. Android, on the other hand, allows open access for software, and developers can provide apps with ease. App stores (see below) can be a mixed blessing.

There are advertised ways to run Android apps on iOS, and iOS apps on Android. These are outside the scope of this guide, and anyone contemplating such use needs high skill levels, and probably a lot of patience and tolerance.

So, the music user needs to choose their platform with care.

3.2 Authentic?

It is important for a user to be sure they have an authentic and legitimate copy of an app. Software piracy is a particular problem in music, and choosing to use a pirate copy can be tempting. It is, however, never a good choice for many reasons.

Software authors work hard to create apps that work well for users. When they set a price, they know the work will be rewarded and that they will be able to continue to support and upgrade the app. Piracy undermines this, and discourages them from working on the project. Software writers who cannot be paid will find other careers, and apps, particularly music apps, will not be developed. In addition, piracy is illegal and unethical.

Getting an app from an app store is usually a safe way of ensuring that the original author is being paid. Business models vary, and sometimes a single payment is required, but in other circumstances a subscription is needed. Often advanced features need to be paid for separately. Each user can make their own decision about the package of features they need for their work. Buying from an app store usually registers the software so that updates are automatically offered (more on this below).

Getting an app outside the app store framework does not in itself mean the software is not legitimate. Some writers prefer to avoid the percentage of revenue they have to pay to app stores by offering their own download service. This can be entirely proper. However, unscrupulous traders do take advantage by offering other people's apps as their own, without passing any payments to the software authors.

Most worryingly, writers of malware – software intended to cause harm and often to steal personal information – choose attractive and popular apps to carry their code on to user

devices. An attractive, free copy of a popular app may in fact provide the writer with access to the user's email, photographs or bank details.

Finally, it should be noted that a modified copy of an app may be entirely legitimate. Some software authors create open-source software and allow their code to be reused by others. Sometimes other authors will create improvements, and these can be integrated into the app. But at times, the other author will use the code to create their own version of the app, entirely properly if sometimes controversially. This is known as forking the app because there are now two (or more) different versions of it. If there is any doubt about the legitimacy of a derivative app, the licenses should be checked carefully.

3.3 Up to date?

Even on a single platform, there are compatibility issues to be checked. The operating system software on devices is updated from time to time. This could be to address a security concern or to implement new capabilities or a refreshed appearance. The same applies to apps. A new version may bring new functionality or improved performance. Either of these two processes may be problematic. Most frequently a revision of an app may need the most recent operating system version as it is taking advantage of new features. Less often, a new operating system release may break compatibility with older versions of apps, sometimes because the app was doing something now regarded as a security hazard.

All systems give users the option to install updates automatically as they become available. Usually, the other options are to do nothing, or to seek permission from the user for the new software to be installed. For those using apps professionally, it is not acceptable to find

that an incompatibility has arisen and they cannot access their work. So automatic installation should be avoided.

That said, sometimes the update is to address an issue (a bug) that might cause inconvenience or data loss. In these circumstances, updating is highly desirable and should not be ignored. Therefore, the recommendation for someone using apps for music, possibly to support their livelihood, depends on their self-discipline. They should either:

- set the device to ignore updates but regularly check whether new software is available; or
- set the device to prompt when updates are ready but resist the temptation to simply click agree because 'newer must be better'.

In either case, the user should check the software creator's website to see if there are new requirements with the update. If there are, these will usually be noted prominently, and should be researched with diligence. There may be cases where support of older hardware devices (see section **Error! Reference source not found.**) is being withdrawn and a decision needs to be made on whether that is more important than other aspects of the update.

3.4 Keyboards and microphones

This is about typewriter-style keyboards. Piano-style keyboards appear in section **Error! Reference source not found.**.

The classic Blackberry with its hardware keyboard has largely been replaced by on-screen keyboards but there are choices about how to interact with an app on a device. On-screen keyboards are more effective than might appear likely and contain clever technology to work out where the user intended to press, even if their fingers covered several buttons.

The alternative to the on-screen keyboard is to use voice recognition. This broadly polarizes users, who either love it or hate it. Speech recognition, like keyboard handling, is better than might be assumed but is still far from 100 per cent accurate. It does require talking to, rather than via, a phone and some users find that awkward.

Voice recognition can be overheard by strangers, and they can steal ideas. That would be hard to prove and could be expensive, or painful.

3.5 Language support

This guide is written in English, and most apps will be available for English speakers, but many users will prefer a different language. Although the operating systems support many languages and the characters they use, the apps themselves may not support non-English speakers.

Users need to be sure they can make use of an app in a language in which it is available. Many apps are highly intuitive and use symbols as much as words, so language may not be so much of an issue, but documentation and support may prove an obstacle. Investigation is required before an app is chosen.

3.6 Cloud storage

It can be difficult to get data on and off a device and the preferred route is often to synchronize with a cloud service. This uses the data connection of the device (whether Wi-Fi or phone network-based) to store data in a remote data store that can be accessed from the same device or from other devices. At best, this gives a smooth and seamless feel to using an app. Items stored from a phone appear almost immediately on tablets and computers

logged into the same account. At worst, poor connectivity can lead to frustration and inaccessible data.

Text data such as lyrics or credits lists are small in size. This means they occupy only a small part of a user's cloud storage quota, and, importantly, are carried over networks quickly, so they sync without delay. Media files – video, especially, but also audio – are very much larger and will rapidly fill a cloud-based store. They also take longer to synchronize and may exhaust network usage limits where these are imposed, typically on mobile networks rather than Wi-Fi.

There are cloud storage services associated with manufacturers: Apple has its iCloud service, and makers of Android phones typically offer Google Drive. There are free-standing cloud services such as Dropbox and Microsoft OneDrive. The sophistication of the integration of these services into apps varies widely, as does their performance across platforms. Apple's iCloud does work on a Windows PC but many of its features, unsurprisingly, work best on Apple PCs and devices.

The choice of cloud storage provider depends on how well they work with the apps that are important to a user, and the price charged for the amount of storage needed. Most services are cheap or free for small capacity, but for media files themselves, costs can escalate.

3.7 Security

Using apps is no different from using other computer systems or bank accounts. Users need to ensure that only they have access to important or sensitive data – music files in this case. Using a password manager is a good way to avoid the temptation of using the same password across many apps, which may mean that one data leak compromises all systems.

There are many guides to good data security and hygiene. Following them will protect a creator against losses, leaks and consequent embarrassment.

3.8 Backup

It is tempting to assume that because something is stored in the cloud, it is safe for future access. While reputable cloud service providers are unlikely to lose data inadvertently, they can go out of business. They will also delete files if the user directs them to do so. It is easy for a user to do this by accident and the cloud service provider can hardly be blamed for doing what it is told. Users need to implement a backup strategy for their data that suits their needs. The client service provider may offer this, allowing access to old versions of the file or protecting the user by moving deletions to a waste-bin folder rather than erasing them. Even this may not be enough.

Some data security experts suggest that if you do not have three copies of something over two different locations, you do not really own it. Users need to decide if this is the right approach for them, but it is a good starting point.

3.9 Apps and websites

A final general issue relates to the distinction between an app and a website. There is less distance between these than it might seem. An app has a custom appearance but likely works with a server designed to interface with it. A website can act not only as a server but also deliver a custom interface to a web browser that can make it look like an app. But more than this, an app can be little more than a web browser with all its appearance delivered from a server that works as if it were talking to a generic web browser. This can be a very efficient way of creating an app, and it does muddy the water.

In this guide, the focus will be on stand-alone apps, which likely have their own icon on the phone home screen, but occasionally reference will be made to services accessible through web browsers. It would not be surprising if a customized app became available for these services.

4 The world of music

This guide covers the complete journey of a piece of music, from an idea in the composer's head to the smile on a listener's face as they enjoy it – (as outlined in section 2). It includes apps that help with songwriting, and with keeping records so the proper rewards are retained. It moves on to apps that assist with rehearsing a song with a group of musicians, creating musical sounds and recording them for others to enjoy. The use of apps to process the recording so it is as attractive as possible, thereby reflecting credit on the creators, completes the creative stage, and also indicates where other apps come into play.

These push the recording out into the world, maintain an account of who should be paid for it, and ensure the catalogs of libraries, online services and copyright agencies are fully informed, and that agencies able to protect the song and recording have the right information to do so.

These sections will address these steps in turn, provide advice on the use of apps, and highlight potential hazards.

4.1 General purpose apps

Some of the apps discussed are not specific to the music sector. They have a purpose that can be used in music but also in other fields. This does not make them inferior. Indeed, being good at one thing across many spheres is an indication that the software creator has

the expertise needed to build highly functional apps. The user needs to accept, though, that they will be switching between apps to do different things.

4.2 Music support apps

Some of the apps referenced are intended to provide assistance across multiple phases of the music creation process. They have been designed by music people to do music tasks. This means that they can do many things, but the user must accept the common paradigm of the app across all stages of writing and production. That can create friction in some tasks. Because the app is multifunctional, it is hard to switch out to a different app for one task if that is the one that grates.

Box 3 **Session Studio**

Session Studio is fronted by three Swedish music stars and has its roots in songwriting but also provides creation, communication and record-keeping services for performers and producers. It is available on iOS and Android apps, as well as Mac.

More information is available on the Session Studio website,

https://www.sessionstudio.com/about

Box 4 **VEVA Collect**

The VEVA Collect development team has been active in the standards world and was an early adopter of common specifications, including the Recording Information Notification (RIN) from industry consortium Digital Data Exchange (DDEX). There are iOS and Android apps, and a web portal.

More information is available on the VEVA Collect website, https://vevacollect.com.

Box 5 **Sound Credit**

Sound Credit is a service based in Memphis, Tennessee, to collect and document credits for music. It focuses on recordings rather than compositions and offers a web portal, iOS and Android apps, and a workstation plug-in that gives tight integration with the recording and mixing process.

More information is available on the Sound Credit website, https://www.soundcredit.com.

To avoid repetition, this guide will not point out every time this kind of all-in-one app can do the job. Most offer at least something in most of the areas described.

4.3 Music creation apps

The GarageBand app, provided free with every iPhone and iPad, will synthesize, record, mix and play back music projects. While it is somewhat basic (understandably, given Apple wants to sell its paid-for Logic app for more sophisticated uses), in creative hands it can do a great deal.

Android does not come with a basic music creation tool but there are numerous apps available inexpensively, or even free, that claim to offer all that GarageBand offers. Manufacturers who adopt Android often include their own apps, so there may be a music creation app already loaded.

Again, this guide will not highlight every function that can be carried out with one of these music-creation apps. It will, however, note where they are particularly powerful.

4.4 Choosing apps

The choice between general-purpose and music-specialist apps is one that only the user can make, and they need to try them to see which type suits their style and needs. Reviews, including online reports, can be helpful, but ultimately the personal reaction to an app is what makes the difference to it being a help or a hindrance.

5 Songwriting

Songwriting can be the most personal and private activity, with the deep recesses of the psyche mined for emotions and recollections, and transformed into something that can be performed. Or it can be a production line, such as New York's Brill Building in the 1960s, where hugely proficient writers collaborated to generate hit after hit.

In either case – and the wide spectrum between – there are apps providing tools that can assist.

5.1 Idea noting

Songs are not always born in the studio or at the study desk. Ideas come in random places and at random times. The human brain is adept at forgetting these ideas unless they are written down or otherwise recorded. A notebook is the traditional mechanism for ensuring that ideas are not lost. In the modern world, the equivalent is the note-taking app, where rough ideas can be written down and later sifted for inspiration.

Ideas are not protected by copyright but once they are written down or recorded, the protections kick in. This alone makes immediately noting down worthwhile.

Evernote and Microsoft OneNote are perhaps the best known of this class of app. Both are organized into notebooks and allow a notebook of songwriting ideas to exist alongside others covering more mundane tasks, such as shopping or car insurance renewal. Each needs a little discipline in use, and neither is super-fast to start up and be ready to capture an idea. But both are mature, effective and general enough to be used across a lifestyle.

Any basic editor can be used to jot down text ideas, but the more sophisticated ones allow searching and provide time stamps. They can be evaluated reasonably quickly, and, as the market evolves so fast, reading online reviews is sensible.

This guide will not deal in depth with artificial intelligence (AI) but we may expect to see apps that provide guidance to a writer working on ideas and lyrics. This can work both ways; providing inspiration through connected concepts but also highlighting existing work that might otherwise be copied accidentally.

5.2 Snippet recording

Not all songwriters work with sheet music and notation. Some are self-taught and the main way to memorialize a musical idea is to record themselves playing it, or singing or whistling. It is important to be able to keep an idea for the medium to long term (to show a judge it was your song in the first place), and to send it to other collaborators.

Apple devices come with Voice Memos preinstalled, and while this does not sound promising for music, and will not win any Grammys, it is perfectly good for music memos as well as the speech it was named for. Android devices vary in what is installed at the factory but most will come with a basic recorder.

Both Evernote and Microsoft OneNote allow an audio recording to be included in a note, with certain limits on data size and duration. Placing the recording on a notebook page

allows all sorts of text to be associated, including influences, contributions, alternative lyrics – anything really.

Any of the recording apps discussed in section 6 can be used to record snippets but they are typically rather cumbersome for this simple task, and by the time they are ready to record, the idea may have passed. Plenty of alternatives are available but, as with Apple's Voice Memos, they are typically badged as speech recorders. Again, this is not usually a problem.

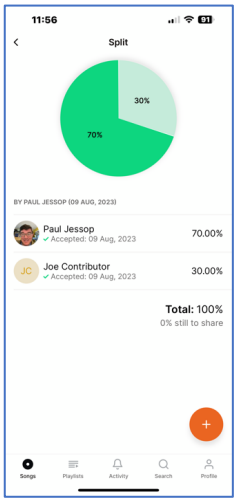
5.3 Session recordkeeping

Although creativity is a joyful experience, it is the paperwork associated with exploiting it that puts meals on the table. This is particularly true of songwriting, where showing who created what, where and when is the key to being paid. The trend for songwriting to become a team-based activity makes this more important than ever. In the past, songwriters tended to be solo practitioners, or perhaps music and lyrics partnerships. Today, multiple specialist writers often bring different skills to a song and their contributions need to be recorded and apportioned by agreement. Unsurprisingly this is difficult, and occasionally contentious.

There are various apps that allow songwriters to note their participation in writing a song and some enable the agreement of splits (the proportion of income that each writing contributor will receive). Agreeing this division is critical because until all the writers are documented, and the shares add up to 100 per cent, royalties will often sit in someone else's bank account, waiting for the paperwork to catch up with reality.

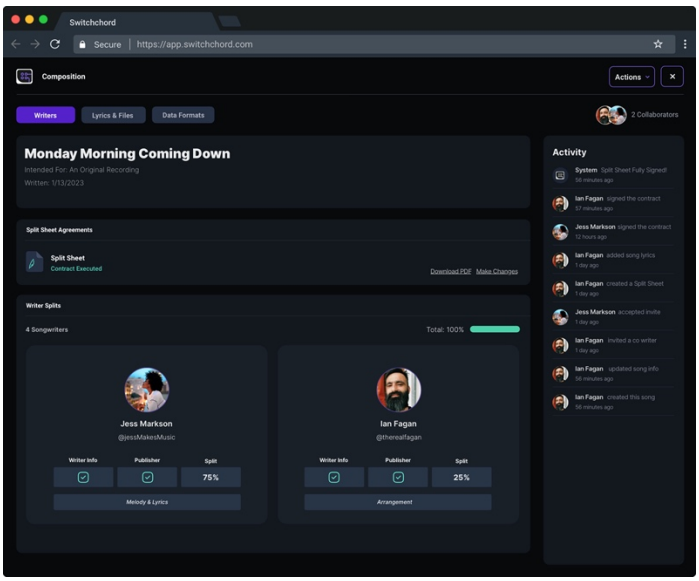
Box 6 **Recording songwriter splits**

Session Studio (see section 4.2) is one of the apps that allows splits to be recorded. Here, my hypothetical collaborator, Joe Contributor, has agreed that he is due 30 per cent of the royalties on our new song.



Songwriter Splits in Session Studio: Source: Screenshot from Session Studio app.

New to the field is Switchcord. It uses crypto technology to turn agreed splits into a smart contract that ensures fair distribution of royalties when they come in. Other apps work in a similar way.



Songwriter splits in Switchchord: **Source: Screenshot from Switchchord application.**

Most of these apps allow collaborating songwriters to propose and accept (or reject) split arrangements on their own devices, indicating when all participants have agreed. Some recent developments encode these arrangements as a so-called smart contract, with the prospect of allowing immediate and automated trade in music, and royalties received in real time (rather than in arrears, on a monthly or quarterly basis). This is an emerging field, and whether it will be widely adopted is not yet clear.

6 Recording

Professionals may sneer at the use of mobile devices for recording music, looking to their vintage microphones, weighty mixing desks and digital audio workstations. In one sense they are correct. Their expensive and hard-to-operate gear will always be able to generate a higher quality project than a phone app. But this misses an important point: music that is not made for lack of expensive recording facilities is lost forever.

Music can be recorded on apps, and this can be entirely suitable for some purposes. Perhaps not for recording the Berlin Philharmonic, but for the 'bedroom producer' the results can be worthwhile.

This section looks mostly at audio recording of music, but the importance of video should not be overlooked. Video has tended to be an afterthought to music, created once the recording is finished as a promotional tool rather than artwork in its own right. The emergence of YouTube as a channel linking the musician and the public has changed this and the video format is an important part of this relationship.

6.1 Quality

Quality means many different things in music, but this section deals with the technical quality of a recording. The next section deals with sample rate and bit depth, which set a hard limit on the fidelity of a recording, but many other factors contribute to quality. Perhaps the most important is the conversion from the analogue world of sound to the digital world of apps. In a phone, the analogue to digital converter is designed to a price and will not be able to compete with studio equipment. That is not to say it is unsuitable for some purposes, but its limitations need to be understood.

The opposite process – converting from digital on the device to analogue for listening – has similar constraints. However, these days the conversion is often done outside the device. Indeed, current phones sometimes fail to provide an analogue output for headphones. With the conversion happening in the headphones, better devices (meaning more expensive devices) will have better converters and offer improved sound quality.

Where wireless headphones are used, the sound quality again depends on the technology. Basic Bluetooth can be quite poor but upgraded versions will sound much better. Normally,

the device and the headphones will use the best system that both are capable of. This does mean that older devices or headphones will not produce the best sound.

6.2 Sample rate and resolution

Central to the issue of sound quality is the digital format used for the recording sound. Without going into too much detail, sound is sampled many thousands of times a second and the resulting value is stored as a digital number. Low sampling frequencies and limited number ranges will produce low quality. Whether sound quality is improved by extending the sampling frequencies to accommodate ultrasonic sounds, or the number range so it can capture the thermal noise in a room, is open to debate, and that can be time-consuming and fractious.

The app user should ensure the app, and the device running it, offer the combination of sample rate and resolution they desire. This should be checked, including whether additional conversions are carried out in a way that is hidden from the user. These conversions are typically high quality, but they will still compromise sound quality.

Although many recording projects now use high-resolution formats, the compact disc parameters of 44.1 kHz sampling and 16-bit resolution in stereo is a good starting point for many users.

6.3 Outboard equipment

As mentioned, the cost-engineered analogue-to-digital conversion stage in many devices was a weak link. One solution is to bypass the built-in conversion stage and perform the function outside the device, connecting to it in a digital way (with negligible loss of quality).

Either a dedicated microphone or an interface box can be added. These connect to the device through the charging/accessory port. On a current Apple iPhone, this port will be the proprietary Lightning connector, and on a modern Android-based phone, a USB-C socket.

In most cases, this external microphone or interface box will appear to apps as another microphone and no difficulty will arise. Compatibility should be checked, however, as lengthy calls to customer support are frustrating and time-wasting.

An issue that must be recognized with external microphones connected through an interface box is that these boxes often do not provide so-called phantom power. This is a mechanism widely used in studio microphones to power the microphone from the equipment it is connected to. Phone interface boxes sometimes cannot provide the power to do this.

6.4 The temptation of portability

Once a device has been equipped with a decent microphone (or even before), it is tempting to make recordings without giving too much thought to permissions and rights. This can be an expensive error. The law on whether a recording requires the consent of the person being recorded varies between countries (and even cities). Careful attention to this will prevent at best unpleasantness, and at worst, an encounter with law enforcement. And that is before creative works and rights in them enter the equation.

If you are going to record music, you need the permission of the performer and, in principle, the songwriter. Failure to obtain these permissions will result in a recording colloquially known as a bootleg. It will open the user making the recording to lawsuits and potential financial loss. There are exceptions to this, with some artists happy to be recorded and making this known in advance, but this is unusual. Normally, permission needs to be sought and – for protection of the recording party – stored safely against any future challenge.

7 Synthesis

Electronic synthesizers developed during the 20th century, starting as analogue devices and becoming digital as the technology evolved. Eventually it became possible to replace digital circuitry with software on general-purpose computers, and the soft synth was born. This software has been implemented on mobile devices, and a wide variety of synthesizer apps are available. Some of these emulate classic synthesizers (clone synthesizers), while others offer new sounds that have never been available from hardware devices.

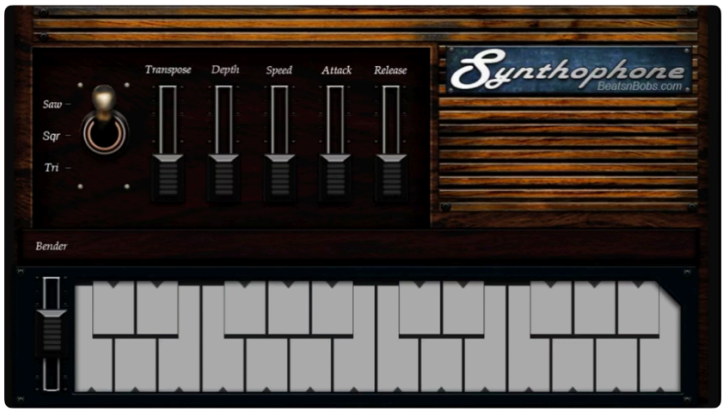
Box 7 **Clone synthesizer apps**

The Stylophone was a distinctive early electronic music instrument played with a stylus.

Stylophone: © Dhscommtech CC BY-SA 3.0,

https://commons.wikimedia.org/w/index.php?curid=9424179

The Synthophone created by Rob Wilmot (see below) is a clone of the Stylophone running on iPads.



Synthophone app: Source: Rob Wilmot via Apple App Store

The Moog Minimoog (see below) is a classic analog synthesizer. Launched in 1970, it is still available today.

Moog Minimoog: Source: Moog Music

The manufacturer, Moog Music, also offers an official clone of the Minimoog, namely the Minimoog Model D App. Similar in appearance to the hardware version, it offers the same sounds and enhanced functionality, produced through a digital emulation.

Minimoog Model D App: Source: Moog Music

7.1 Samplers

One particular class of synthesizer is the sampler, though sampling is an overloaded term in music and signifies many different things. Sampling here means taking a single sound (the sample) and loading it into a synthesizer (the sampler). The original sound is processed to appear at different pitches, according to which key is pressed. It is then possible to play tunes and harmonies using the sound.

Because a sampler can use any sound, there is a temptation to use samples that are in fact subject to copyright. This is risky and problematic. But it is easily solved by ensuring the sample is recorded or supplied specifically for the task. If there is an edge case where an app user thinks there is no copyright in the sample (for instance, that it is thought to be too short to qualify for copyright protection), this should be confirmed with a legal expert.

7.2 Patches

When a synthesizer is configured to make a particular sound, the arrangement of controls and connections is termed a patch. This derives from the days when synthesizers used

cables (patch cords) to connect modules together. These patches define a particular sound, and may be provided by the synthesizer manufacturer/programmer but also by third parties. These patches should be considered in the same way as apps and used only with the permission of the creator.

Normally the terms of use of a synthesizer or patch allows the user to distribute music created withour royalties being payable, but the terms should be checked.

7.3 Controllers

Just as synthesizers can exist in the real world and in apps, so the controller that allows a user to play the instrument can exist in these two forms. A physical keyboard can be connected to either a synthesizer or a soft synth. But it is also possible to run a controller app on a device and use this to control either sort of instrument.

Connecting controllers is covered in section 12 and is usually straightforward, though there are nuances that need to be addressed.

Keyboards are the most familiar form of controller but there are others that can be used with both real world synthesizers and soft synths. Wind controllers look like a clarinet or saxophone but produce no sound of their own, serving only to control a synthesizer. Similarly, drum kits and guitars can produce outputs for connection to synthesizers.

Synthesizer Controllers: © Ozfir CC-BY 2.0 https://www.flickr.com/photos/ozfir/

Controller apps allow the use of the device screen as a controller. Clearly, this is too small for an effective piano keyboard, but other sorts of keyboard have been implemented in apps, as have control surfaces, sequencers and various accessories. Connection to soft-synth apps will happen internally but external devices are controlled in the same way as connecting a keyboard to a soft synth.

8 Drum loops

Drum machines became popular before the idea of creating music in computers took off, and the sound of the most famous unit, the Roland TR-808 Rhythm Composer, defined the sound of hip-hop music in its early days. The TR-808 is available in numerous emulations in apps, authorized by Roland and otherwise.

Roland TR-808 Rhythm Composer: Source: Roland Corporation

Numerous other drum machines of various sophistication are available as apps. Some, as with the Roland TR-808, emulate real-world drum machines, while others offer their own creation paths and user interfaces.

8.1 Marketplaces

The sequences for drum machines are known as drum loops, and there are many such loops available for use in apps. Some are provided by the manufacturer, either built into the app or available as a download on request. Others come from third parties. Some may be commercial, while others are given away.

Many marketplaces exist for drum loops, and users should be vigilant that they are buying loops from the creator, not from someone who has copied the work. This diligence is not easy but is a responsibility that should not be taken lightly.

8.2 Licenses

A typical license on a drum loop (often called a royalty-free license) allows the user to create their own music that includes the drum loop, and sell it as they like without further payment to the provider. But it will not allow the resale or gifting of the loop on its own, outside a new creation. For the creator, this type of license means they receive nothing if the loop is used on a recording that becomes extremely successful. It is a trade-off between likely sales and potential revenue.

Other licensing models are uncommon on basic drum loops but are found more often with sophisticated loops, as described below.

9 Beyond drum loops

As well as the loops programmed directly into a drum machine app, there are apps that create drum backing tracks from recordings (real or synthetic) of drums or drum machines. These are widely distributed for many different drumming apps and are just a sound recording that can be loaded into the app and looped.

Numerous apps will accept these loops. Even simple general-purpose music apps such as GarageBand can take these loops and turn them into backing tracks.

9.1 Acid Loops

A more sophisticated format includes pitch and timing information in the loop file itself, so that a matching app can use this information to stretch the loop to a different length without changing the pitch of the included drums. These are sometimes known as Acid Loops (or acidized loops) after the original desktop program that uses them (Acid Pro, originally owned by Sonic Foundry, then Sony, but now by MAGIX).

9.2 Beats

If sampling is a badly overused term, then so is beat. It is quite possible, the usage will have changed between the creation and reading of this guide. At the time of writing, beats are ready-to-use elements of a finished recording that can be bought online and used at will. They often encompass more than just a rhythm section, such as melodic lines and backing harmonies.

Many markets exist for beats, and they can be imported into most general-purpose music apps.

Typically, an upfront fee is required to download a beat but the license that accompanies it is not without restrictions. It may limit the way the beat can be used, be good for only a certain number of streams, or include other obligations. There is almost complete flexibility in setting terms, which means both parties are required to proceed with care. On the one hand, the creator needs to be sure that if someone picks up their beat, and has a massive hit with it, they get a share of the success. On the other hand, the user must ensure their obligations are reasonable and affordable. If both parties are happy, it can be a successful combination.

10 Mixing

Before electrical recording was developed, musicians had to huddle around a single microphone horn and balance their performance by moving themselves and their instruments, and modulating their level. A device running a recording app is doing much the same thing if it tries to use a single microphone to record multiple performers.

The modern approach is to make a multitrack recording and to mix down the component tracks to a composite output. The tracks may be recorded at the same time with isolation between them, or they may be recorded separately, usually against a rhythm track that is laid down first. The latter is more practical in an app, simply because connecting multiple microphones is not easy. Any music creation app can do this and store the multiple tracks together.

Mixing the tracks has traditionally been done on a large desk with each track having its own fader and other controls over the sound. While controllers with faders can be connected to apps (see section **Error! Reference source not found.**), the task can be done on-screen, which is easier on a tablet than on a phone.

All the music creation apps can do this, and also offer a range of effects that can be applied to tracks and the final mix. These effects, such as reverberation, echo, equalization and compression, are implemented in software and each process uses up computing resources. These resources are limited on all platforms, but in an app, the user may exhaust the available computing power earlier than on a desktop computer. This may limit the number of effects that can be used at the same time.

10.1 File export

The purpose of mixing is to create an output file, usually in stereo. The mixing app will be able to export the final mix in a variety of formats, and there is seldom reason to use anything other than an uncompressed, uncompromised format, such as WAV or FLAC. This will be written to a file transfer area on the device so that it can be moved to a computer or written into cloud storage.

10.2 File tagging

If the mix is considered finished without a mastering stage, then the exported file might have metadata tags added at this point. The music creation app will be able to do this, and all the output formats support the carriage of such tags. This data will usually be provided separately to downstream services but putting the metadata in tags ensures that if the documentation is separated from the file, the information can be recovered. The metadata to be added should include the name of the performer and, if possible, the songwriter. The name of the track should be added if it is known, though sometimes the name under which a track is released is decided after recording. The name can be edited with a tag editing app or on a desktop computer further down the content preparation chain.

It is important that unique codes are used as identifiers wherever possible. While there are many bands named Atlas, and many songs with the title, 'I want you', the codes remove all ambiguity and confusion: each Atlas has a different number, and similarly each song entitled 'I want you' has a distinct code. There are different codes for different kinds of things, including people, songs, recordings and products. Most are standards that are published by ISO, the International Organization for Standardization, and all are widely adopted in the music sector.

Music identifiers and where they come from:

What	*Identifier*	*Abbreviation*	*Standardized by ISO?*
Name of creator	International Standard Name Identifier	ISNI	Yes
Songwriter	Interested Party Information	IPI name number	No (private to songwriter collective management organizations)
Performer	International Performer Number	IPN	No (private to performer collective management organizations)
Song composition	International Standard Musical Work Code	ISWC	Yes
Recording or music video	International Standard Recording Code	ISRC	Yes
Video	International Standard Audiovisual Number	ISAN	Yes
Video	Entertainment Identifier Registry	EIDR	Yes (as a Digital Object Identifier)

Source: Identifier websites

The recording artist should ideally be identified with at least an International Standard Name Identifier (ISNI), and the tag should include the ISNI of the band, as well as the individual ISNIs of the band members.

The recording should be identified with an International Standard Recording Code (ISRC). Independent artists often choose to have the ISRC assigned by the distributor, who accepts the file and sends it on to the large retail services. The distributor will construct a code and associate it with the file that has come from the app. They will generally not tag the file with the code, but given most services focus on streaming, end users will not be able to examine

the tags anyway. Some artists prefer to manage their own ISRCs and these should be included as a tag in the file, as well as being recorded along with the other metadata.

The code for compositions is the International Standard Musical Work Code (ISWC) and it is assigned through registration agencies, which also act as rights management organizations. The composition in a cover version, or a recording of a prewritten song, may already have an ISWC and this should be included in a tag as well as in the recording metadata. This will assist the songwriters in receiving royalties they are due for use of their song in the recording. If the song has been written in the studio as it was recorded (that is, the song did not exist before recording started), currently it will not be possible to include ISWC information as it will not be assigned in time. This may change, and creators should keep abreast of any developments.

A music video may be given an ISRC (the same identifier as a sound recording), an International Standard Audiovisual Number (ISAN) or a code in the Entertainment Identifer Register (EIDR) – or possible all three. The codes are used for different purposes in different territories or regions, and there is little consistency. Local advice should be sought on what is useful and what business partners will expect.

Some apps make the tagging of recordings with unique identifiers particularly easy, by looking up the right identifier, or getting a new one where appropriate. Both Session Studio and Sound Credit allow the retrieval or assignment of an ISNI for instance. This will undoubtedly become increasingly common.

11 Mastering

Along with sample and beat, mastering is a word that has multiple meanings in music. It can mean the initial process of creating a glass master from which compact discs can be made (or indeed the shellac master from which vinyl can be pressed). But today mastering generally refers to the final process in creating a recording. After the mix is finished, the balance between the various vocal and instrumental contributions is decided. Mastering takes that balanced stereo recording and applies overall control to the level, equalization and compression of the track, including making sure that the tracks on an album or EP sound good next to each other.

Mastering is sometimes described as making a track sound louder, and this can be one of the results. However, this can be at the expense of nuance and expressiveness, and mastering deserves to be carried out with care.

11.1 Mastering apps

Mastering can be done in one of the music creation apps – all the tools are present in most of the available apps. But there are specialist apps that remove the clutter of mixing and effects, allowing the user to focus on the task at hand, with the best available processing for mastering. These take a stereo file stored on the device and process it to create finished stereo.

If the input file has been tagged with metadata, it is worth checking that the mastering app does not accidentally delete all the tags. This would negate the purpose of including them. If deletion is a concern, it may be worth delaying the tagging step and adding the metadata after mastering.

11.2 Cloud-based mastering

As an alternative to manually processing a recording in a mastering app, it is possible to have it done automatically by a service. The mastering process analyses the recording and typically takes action on the basis of machine learning and AI. Given this may require more processing power than a portable device can offer, these services upload the recording to the cloud and process it there.

These services typically offer an app that allows recordings to be uploaded to the cloud service and then distributed to retail services. Users should be sure to check the mastered version carefully before authorizing the distribution of their work.

12 Connecting apps

Apps connect in various ways. They read and write files stored on the device and take input from the user. But sometimes apps need to 'talk' to each other and sometimes they need to talk to external devices. Users will confirm that this is either an almost magical process that 'just works', or a source of massive frustration, as connections are not made or fail for no apparent reason. It is beyond the remit of this guide to describe in detail the inner workings of either Apple's iOS or Android, but each has a framework for moving music and music control signals internally. When apps conform to this framework, the data will flow like water, and, for instance, a music synthesizer will appear as an input to a recording app just like the internal microphone.

Connection to external microphones and instruments has been discussed (see section 6.3), but where the connection is for control rather than the music itself, the technology used is almost always the Musical Instrument Digital Interface (MIDI). MIDI allows a keyboard, for

example, to send information about notes played and the intended loudness as indicated by the velocity of the key-press. It also allows an external synthesizer to play particular notes with a particular pitch bend.

MIDI was originally specified to communicate over large DIN connectors and it is still possible to buy an interface for a device with such plugs and sockets. These devices appear in the framework mentioned above, and data sent from and destined for external devices will be routed to and from the appropriate app.

It is also possible to connect MIDI over different technologies, including USB sockets, hardwired Ethernet and Wi-Fi. Careful reading of the specifications of devices a user wishes to connect should reveal whether it will work.

13 Distribution/uploading to platforms

Many large retail platforms do not allow independent artists and small labels to upload directly to them. Such content owners are required to work through a distributor. Smaller or more specialized platforms do allow direct upload by users. Some of these platforms and distributors offer a specialized app that facilitates uploading of recordings.

13.1 File formats

When using such apps, there will probably be a wide choice of acceptable file formats. Users should check whether the platform or distributor will automatically transcode to other formats (that is, convert from one format to another). The format and quality level selected for upload should in general be as high as possible, so sound quality, which can never be fully recovered once lost, is not compromised.

As a rule of thumb, compact disc quality in an uncompressed format is the minimum that should be accepted. This involves 44.1 kHz sample rate and 16 bits per channel, and a lossless format such as WAV or FLAC.

Generally, there is not a licensing issue with the format chosen. Most of the patents on the commonly used formats have long since expired. However, if an app offers a new technology (which will likely be of little use as few people will be able to accept it), it is worth checking whether it comes with any unwelcome restrictions on use.

13.2 Metadata

As well as the tagging described in 10.2, this is the point at which full metadata describing the recording can be entered. The app may extract information from the tags but, even then, there is more to be added. This should be accurate and comprehensive.

The relevant identifying codes (IPI, IPD, ISNI, ISRC and ISWC) should be included through the uploading app.

13.3 Rights

One class of metadata that is critical at this stage relates to the ownership of the recording and the composition. This information must be entered accurately or serious problems may subsequently emerge. In many cases, it will be clear that the uploader is also the rights owner in the recording, and this can be entered into the app. However, if the song is not original, information about the actual songwriter is important if they are to be paid correctly. If they are not paid correctly, then the recording is probably unlicensed, and the uploader may face consequences they were not anticipating.

For the recording rights (sometimes called the master rights), the distributor may regard the uploader as responsible for any sharing that is required with joint owners. This makes life simple for them but places a burden on the uploader to check statements and make proper payment to partners. More sophisticated arrangements (typically with higher fees) may allow the splits in recording ownership to be uploaded through the distributor's app, and the distributor will then make payments direct to the individual owners.

For the rights in the composition, it is common for a single songwriter to be self-administered, but where a team of songwriters is involved (as is common with hit records), a publishing company (which takes ownership of the rights) or a publishing administration company is often involved. Providing the right information about these rights is critical to the money getting to the appropriate people quickly.

Providing the performer lineup to the distributor is important for content discovery; providing it to the relevant collective management organization (or CMO, see section 16.1) is critical if performers are to receive any neighboring rights payments (see section 14.1) after the recording is used in circumstances attracting such royalties, typically, webcast, radio or satellite broadcast.

It goes without saying that an uploader should not be uploading recordings that they do not have permission to offer. If they are not the owner, the platform may need proof that permission has been offered.

14 Documentation

This guide has introduced apps that allow songwriters to keep track of writing activities, in particular, joint writing activities (seesection 5.3). Similar apps are available to assist with

recordkeeping in the recording studio (and again, the studio may be a bedroom or a study rather than an acoustically treated space festooned with microphones).

14.1 Who did what

Information about performers who participated in a particular recording is known as a performer lineup. As well as being of general interest, lineup information is used by certain rights agencies to distribute money (royalties) to performers, independently of any deal they have with the recording owner. Termed neighboring rights (because they are neighbors to the copyright held by the songwriter), they can be an important part of a performer's income. So, getting this information right is critical.

Other information that is surprisingly significant is the location at which a recording was made, or at least the country of that location. For rather obscure legal reasons, this can affect whether neighboring rights payments are made. Again, correctly recording this data is important.

Many music support apps offer the capability to note the identity and role of performers, with some going a lot further. They enable musicians to register in the studio through their own app so that their identity automatically finds its way into the recording data. Alternatively, musicians may have a barcode card that the music support app scans.

An important area where music support and music creation apps work together (or need to be made to work together by the user) is in tracking versions of a recording and determining which have been offered to partners for review.

14.2 Interoperability

There is a standard format that describes a recording in detail. Its specification is published by the industry consortium Digital Data Exchange (DDEX) and is called Recording Information Notification (RIN). Many music support apps do implement RIN and a growing number of recording recipients accept RIN files alongside the recording, and register the supplied metadata with the recording.

As well as apps, RIN has been implemented in digital audio workstations and plug-ins that work on them. This broadens the benefit to all potential users.

In principle, a RIN file from one app is exactly the same format as a RIN file from a different app, so the recipient only needs to understand that single format. Without such a standard, every system (app, database, website) would have its own format and would therefore need to support every other format that has been implemented. This complexity (or worse, the inability to delivery anything except basic name and performer information) is avoided if everyone uses the same highly capable format.

Another benefit is that new apps and services can enter the market rapidly as they can immediately work with existing systems and data. This promotes innovation, and keeps existing players on their toes.

Much of the information that can be collected by an app in the studio is typically discarded before it reaches a listener. That may be entirely appropriate for the casual listener but richer data about a recording can now be sent alongside the essential data, and RIN makes it easier to provide the information. Most listeners may not care whether the guitarist used a Les Paul guitar or a Stratocaster, but apps make this data easy to collect, and RIN makes it easy to deliver.

15 Social media

Any discussion about the fast-moving world of social media will inevitably be out of date as it is written. But, it is worth noting, many social media apps offer opportunities for music creators to interact with the service in novel and exciting ways.

As well as the simple ability to upload a music recording or video, some social media apps encourage collaboration by, for instance, allowing the user to add their creative input to existing material such as backing tracks or videos. The reverse is also true. Apps allow users to add their own video to existing (authorized) music material. Homemade dance routines are a particular favourite, and a new, danceable track will rapidly acquire a library of dancing videos.

Copyright issues on social media are often neglected but this is a mistake. Posting a rough mix of your own work to a social media channel is fine (if you understand you may not get paid for it). But it becomes uncomfortable when you discover an uncleared sample you had forgotten about. Social media deserves to be treated the same as formal distribution, with the care and diligence that implies. The ease with which an app allows uploading of a clip or a reel should not distract from the important rights issues.

Of course, each social media platform has its own rules on reuse that users accept when they upload, though they probably accepted these terms and conditions years before when signing up for an account. These are usually nonnegotiable, so if a creator does not want teenagers posting videos of themselves dancing to a track, using the platform's app to upload it may be unwise.

That media is 'social' does not mean it is exclusively recreational. Professional and semiprofessional use of social media, and in particular, searching for and working with collaborators, is breaking down geographical borders between creators. This, incidentally, is one of the reasons why noting the country where a recording was made is important.

16 Copyright (and other) registration

Copyright registration is a complex area, and varies between countries. In principle, no registration is needed to secure protection, given the 'no formalities' provision of the Berne Convention for the Protection of Literary and Artistic Works that regulates international copyright law. In practice, some countries do require registration to take practical advantage of an existing copyright. The United States of America is a case in point. Other countries run registration systems that assist copyright owners and potential users of their work, creating a catalog of copyrights that both groups can consult.

Although some national copyright registration systems do offer web access, few appear to offer an app or a generic interface into which a third-party app can plug. This might change as apps become more popular than websites.

WIPO has made a study of these systems and what they can offer. This confirms that the field not yet well developed but much thought appears to be going into future developments.

There are other forms of registration that are more or less closely associated with copyright registration. Some are noted here but not all are actionable through apps.

16.1 Registration for royalties

Some copyright agencies offer an app to manage the relationship between creator and agency. For example, in the United States of America, SoundExchange offers an app on both Apple iOS and Android. These can be a convenient alternative to using a web page, though there is currently little integration with generic music support apps. This may develop over the coming years.

16.2 Registration for content recognition

Some companies operate services that recognize music from its sound rather than its name. These services are used in many different ways: to detect and fight piracy in an online environment and to track what is played on radio and webcasts. The also allow their own apps to identify what is being played in, for instance, a noisy bar. Shazam is perhaps thebest known service. It can inform users of the name of an unknown track and allow it to be added to their playlists. For music to be identified, a reference recording must be supplied to the service operator. This can be done by a distributor or through a direct relationship. Apps do not yet appear to play a role in registration (thought they are central to some recognition services) because most of the submissions come from or through larger companies who make bulk registrations.

16.3 Mandatory deposit

Some national libraries enjoy mandatory deposit, where creators are required to submit copies of new works into the national collection. This requirement may extend to music, though, to date, no library appears to have created an app for this. If they did, they might be overwhelmed by the volumes created.

16.4 Poor man's copyright

Finally, there are apps that support what is known as poor man's copyright. Originally this involved sending a copy of the work to be protected by registered post, either to yourself (and not opening it) or to a trusted party such as a lawyer. The intention was to enable the postmark on the sealed package to prove the work was created no later than that date. Opinions vary wildly on the usefulness of this process but it was once quite popular.

The digital equivalent involves submitting a digital copy of the work to a service that timestamps it and keeps a digital record, which has the same purpose as the unopened envelope. Interest in the concept varies from year to year and Blockchain increased this for a while. Various entities offer a service and users may find it useful, but apps do not currently play a significant role. It should not be confused with actual copyright registration where this is required, or the automatic (and free) creation of copyright where no registration is needed.

17 Retailing platforms

Music download stores emerged in the wake of peer-to-peer piracy, and streaming platforms followed on. Most users of such platforms are end users consuming music for pleasure. But music creators also utilize these services, and their apps, for their own purposes.

Using these platforms to stay current with musical trends is common practice. Going beyond this may be entirely acceptable but users need to understand how their right to listen and be inspired interact with the right of others to have their work protected.

This guide cannot give detailed advice on how much inspiration a user can take from music heard on an online service before getting into trouble for doing so. This is a complicated, fact-dependent area, and if there is doubt, legal advice is certainly needed.

One point that should be recognized is that consumer platforms are intended for consumer consumption, and music obtained from these platforms is not, in general, licensed for professional use, and, in particular, not licensed for use as a sample. This needs to be cleared individually with owners, and failure to do so can be expensive.

Even worse is the practice of downloading copies of music from streaming services. The streams are usually protected by technology intended to prevent persistent copies being retained by users. It is no secret that such technologies can be circumvented, but it must be understood that this breaches the rights of the platform and the creator whose work is being downloaded. It is never sensible to obtain music to import into an app in this way.

18 Trends and futures

This guide is intended to be of practical help but a few indications of where developments are headed may be useful.

The split into Apple iOS and Android operating systems seems likely to be with us for a while, with Android having the global volumes but Apple preferred by many media creators. The computing power of devices running apps will continue to increase and approach that of laptop computers, which may decline as a consequence. Such power will allow more sophisticated music processing.

Operating systems will take advantage of this computing power to offer increasingly comprehensive frameworks for media creation, and software authors will be able to take advantage of these frameworks to craft more functional and easier-to-use apps.

The impact of AI on music apps is not yet clear but is unlikely to be small. Steps that are currently taken by creators will be suggested, or even possibly automatically implemented, by AI engines. This will extend in due course to the music content itself.

19 Practical Guidance

19.1 Checklist for app intellectual property compliance

Have I acquired this app from an authorized source?

Did I use the platform's app store to buy it?

Is my subscription (if appropriate) up to date?

Are any plug-in modules I am using properly licensed?

If I have a personal or educational edition, is my work really in these categories?

19.2 Checklist for app content creation

In writing this song did I copy something else?

If I was inspired by something else, does that rise to the level of copying it?

Have I agreed splits fairly with my cowriters?

If I have included material that is available under a license such as Creative Commons, have I complied with the terms, in particular the attribution rules?

If I have included material I have been informed is in the public domain, am I confident that is true?

In recording this song, have I included material from elsewhere that is not licensed to me for the purpose?

In uploading this recording to a distributor, have I properly described it in sending metadata with the recording?

19.3 Checklists for app metadata registration

Have I informed my publisher and/or distributor of the songwriter splits I have agreed with my cowriters?

Have I informed my distributor of recording (master) rights splits, if appropriate?

If I am handling master rights splits, do my systems (even if just a spreadsheet) allow me to accurately pay my partners?

Have I registered the composition with the relevant CMO (performing rights organization, or PRO), along with the names and identifiers of the writers?

Have I registered the composition with the national copyright administration (if appropriate)?

Have I registered the recording with the relevant CMO (music licensing company/neighboring rights society), along with an accurate and comprehensive list (lineup) of participating performers?

Have I registered the recording with the national copyright administration (if appropriate)?

Have I registered the recording with commercial fingerprinting services (if appropriate)?

Note: to determine the relevant CMO in the territory of creation, check with local industry associations or government departments. In some cases, there will be a choice; for instance, in the United States of America, there are several PROs.