

# Categorisation of Digital Audio Workstations

A review and reflection of features and workflow in modern workstations

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5th of December 2022

## ABSTRACT

The world of Digital Audio Workstations (DAW) is full of alternatives, ranging from easy to use, towards complex software able to do whatever the user wants. Some of them are specialised to do one-of tasks, and others try to capture them all. The common features of DAWs are a linear timeline and vertical tracks with the ability to edit audio. But audio editing tools, features, workflow and GUI differ from workstation to workstation.

The goal of this paper is to understand how digital audio workstations can be categorised on the basis of workflow, layout, functionality and novelty, and how they are carried out to the end user of the PLATFORM. A selection of DAWs has been categorised into Amateur-, Artist-, and Mix Centric.

The results from this study shows that most digital audio workstations share common functions and features, and the proposed categorisation of workstations can be a way of differing how they appeal to users.

## 1. INTRODUCTION

In the late 80s recorded audio became available in digital formats that are non-linear (hard drives, e.c.), and the traditional view of a two axes software editor (y: tracks, x: timeline) emerged. The basic GUI of DAWs has remained quite similar since the early 2000s, and most other DAWs model their design by the XY principle.

In this study, a DAW is referred to as a software program either with or without hardware acceleration, using the XY principle. DAW can also refer to standalone hardware which can also edit audio. Meaning in this paper, a DAW is referred to the traditional workstations used by professionals and amateurs, such as Bandlab, Pro Tools, Logic Pro, Ableton etc.

The basic function of a DAW is audio editing, recording and mixing. But they are not the same in terms of functionality and workflow. Some are more focused towards creativity and songwriting, such as Ableton Live and Logic Pro. Others are focused towards technical abilities, and performance such as Pro Tools. For example Pyramix by Merging Technologies and Ableton Live can both do

the same basic functions, but their toolset and technical specifications are very different.

In this paper, I suggest to categorise workstations into three categories:

**Amateur Centric** are categorised as workstations with limited functionality, focused towards the beginner/amateur musician or producer. They can do basic recording, but can not expand into higher level complexity needed for professional work, limiting the toolset available.

**Artist Centric** is based around the creativity of the artist. Some can be online based, and offer limited functionality, but easy cooperation with other creators. Others can enlighten creativity by offering functionality, routing or a layout that is novel in design and lets the artist or creator think differently on the problem.

**Mix Centric** workstations usually does not have any reasonable limitation in the number of tracks, busses or plugins that the creator can apply. They can be used by professional creators, producers and mixing engineers. Their main function is to be an end-point in the creative process - releasing recorded music or audio straight from the DAW to the desired platform or format.

In a seven year old survey done by macprovideo.com from 2015 [7], the most popular DAWs were ranked as Ableton Live, Logic Pro and Pro Tools. The total ranking can be seen in *table 1*. The survey is based on the readers of MacProVideo, and does not represent a total magnitude of DAW-users. It is also unclear what experience the responders has with audio production.

| Ranking | Percentage % | DAW          |
|---------|--------------|--------------|
| 1       | 23,14 %      | Ableton Live |
| 2       | 16,95 %      | Logic Pro    |
| 3       | 15,13 %      | Pro Tools    |
| 4       | 13,63 %      | FL Studio    |
| 5       | 9,03 %       | Cubase       |
| 6       | 3,80 %       | Studio One   |
| 7       | 3,46 %       | Reason       |

|    |        |                   |
|----|--------|-------------------|
| 8  | 2,49 % | Garageband        |
| 9  | 1,99 % | Sonar             |
| 11 | 0,92 % | Digital Performer |
| 12 | 0,77 % | Bitwig Studio     |
| 13 | 8,70 % | Other             |

Table 1, ranking of the most popular DAWs [7]

## 2. LITERATURE REVIEW

A historical timeline is important to understand how DAWs work today. According to Robert Strachan [6], Cubase and Logic started off as MIDI sequencers, adding support for audio in the 90s. Pro Tools on the other hand was as a recorder, and did not implement MIDI until 2001. When Ableton and FL Studio released in 2001 there were an expectation that everything should be included in the box as a multifunctional DAW not reliant on hardware [6, p 75-79]. In Pro Tools today, a “retro-imitation” or “skeuomorphic” design philosophy of analog hardware is continued because of its historical foundation as a recorder [2]. To some degree this can be the same seen in Pyramix [8], a DAW that is strictly used for recording and mixing in ultra high sample rate for classical music. Functionality trumps looks, showing no intent of the everyday person using it to create their new song via virtual instruments.

This showcases how process-oriented design can disconnect traditional thought of audio equipment and away from retro-imitating a function. Mike D’Errico thinks about workstations interfaces as a “process that encourages playful forms of creativity” [2]. Pro Tools and Ableton are built on different foundations, therefore creating different interface design and functions for the user.

Each DAW has their own novelty and features, and it affects how users create music. In a video by Rick Beato [9] he argues that computer killed the rock music with Beat Detection by AVID/ DigiDesign. In 2001 this feature was released, and music went from fluctuating a few beats per minute in a song, to be quantised to the grid. Previously this feature were only available through MIDI sequencing, but together with auto-tune, they soon became essential tools to have in other DAWs, either form a third party or as a standalone plug-in. This is one example of a plugin that has spread from one DAW to another, influencing built in time-flex and autotune as essential tools today.

A figure showing the most common DAWs from the UK Top Thirty Tracks from the 18th of January 2015 [6, p 44] shows that 17 were produced in Pro Tools, 11 in Logic Pro, 1 in Ableton Live, 1 in FL Studio and 1 in Presonus Studio One. One of the songs were produced in both Pro Tools and Logic Pro. In comparison to macprovideo.com's survey from the same time-period (Table 1), Ableton ranks first, Logic Pro second, and Pro Tools third. Its clear that there is a difference in the pro-

fessional market vs. home-studio environments, with professional producers and mixing engineers leaning towards DAWs popular in recording studio environments.

## 3. METHODOLOGY

The DAWs has been tested in different scenarios that are common to do when working with audio or music. Each workstations has been evaluated on the following criteria:

**Layout:** How complex/simple is the layout of the DAW? Are there any functionality that is structurally different from other workstations? How is the initial welcome window in comparison to other workstations, and how does the user engages with the software?

**Functionality:** What features and functions are restrained from the user, such as tracks, plugins, busses. What kind of novelty is there in the toolset? If features are restrained from the user, it’s classified as Amateur Centric. If the DAW has an extensive toolset for producing and creating music, it’s classified as Artist Centric. If the tools are oriented towards multitrack recording, editing of audio and mixing, its Mix Centric.

**Recording:** Is the main functionality of the DAW to record music, and how does it facilitate this? Mix Centric if centred around recording multitrack.

**Virtual Instruments/MIDI:** How does the workstation handle virtual instrument/MIDI? How is the selection of instruments, and how does it handle editing MIDI tracks? If the DAW supports extensive handling of MIDI and instrument libraries, it classifies as Artist Centric.

**Ease of Editing:** What tools are available to manipulate the audio further than cutting/splicing? Poor implementation classifies as Amateur Centric. Good implementation classifies as Mix Centric.

**Main Selling Point:** What is the main selling-point of the DAW, and how does it try to appeal to the consumer.

The following workstations were selected and pre-sorted:

### Amateur Centric

- Bandlab
- Soundtrap

### Artist Centric

- Ableton Live
- FL Studio

### Mix Centric

- Logic Pro
- Pro Tools

## 4. DAW EVALUATION

### 4.1. Amateur Centric

Inexpensive or free entry-points for recording & editing audio, producing and writing songs.

#### 4.1.1 BandLab Studio

**Pricing:** Free

**Availability:** Most modern browsers on desktop, iOS and Android.

BandLab is a free DAW in your browser that lets the user record and edit MIDI or audio. It's also a social network of songs created in their workstations. Users can share their ideas, and come with feedback on others. There is also a collaborative function where multiple users can work together on the same project.

**Layout:** A familiar look is presented when opening the workstation. Transport functions, metronome and volume is placed at the top of the window, with tracks below. This is what I would recognise as the most common and basic layout of a DAW. Process oriented design.

**Functions:** Maximum number of BandLabs plugins are limited to 8, and maximum number of tracks is limited to 16. Maximum length of a project is 15 minutes. It has 313 virtual instruments from electric drums to winds. No VST support.

**Recording:** Only one track at time.

**Editing:** Basic editing functionality. Can do fades, cuts, and automation. Also support for flex functionality and record automation from a MIDI controller. Autotune available as a plugin.

MIDI tracks can be edited and quantised. Also has humanise and transpose functions.

**Main selling point:** BandLab markets itself as an online tool for creating and sharing ideas with other people. You can argue that the collaborative and social interactive aspect of BandLab is its main selling point, as the features are quite limited to what's expected in full-fledged DAW design. BandLab can also be collaborated between platforms such as Android/iOS to desktop.

#### 4.1.2 Soundtrap

**Pricing:** From free to €130 annually

**Availability:** Most modern browsers on desktop, iOS and Android

Soundtrap is a workstation by Spotify, and offers browser-based editing of audio for music or podcasts. In comparison to BandLab, Soundtrap does not have a social network of user generated content. But multiple users can collaborate on the same project in real time.

**Layout:** Transport functionality is at the bottom. Each track can has controls for recording, volume, automation, solo and mute. On the right side is where loops, collaborators and the chat is found. Simple and process oriented layout.

**Functions:** There is no limitations to length, tracks or the number of recordable tracks. The *Free* version comes with 4920 loops, 440 instruments and sounds, and freesound.org's library of sounds. The *Complete* version comes with 22480 loops, 940 instruments and sounds, transcription of speech to text, and more. No VST support.

**Recording:** There is no limitation to how many tracks can record at the same time.

**Editing:** Standard editing tools available, such as automation, cuts, split and fades. Also ability to change pitch, autotune, and flex functionality.

**Main selling point:** Soundtrap markets themselves as an educational platform for schools. It offers quite an extensive library of instruments and samples, as well as a few special features such as live transcripts for podcasts. They are marketing both a DAW for music as well as a collaborative podcast studio that can directly publish to Spotify.

### 4.2 . Artist Centric Workstations

#### 4.2.1 Ableton 11

**Pricing:** Four plans, from free to €599

**Availability:** MacOS, Windows

**Layout:** Presents itself with a simplified and prosumers-oriented design. The two main views are *session* and *arrangement*. *Session* displays tracks vertically with all functionality, and is meant for live-use. Each track has clip spots that can be used in live mode with different scenes. *Arrangement* displays tracks and audio in a timeline for editing.

On the left hand side, a browser with all plugins, audio, MIDI, instruments, templates and more. It is the window for engaging the users and Ableton's elements to tracks and clips.

Plugins and effects are not shown in the traditional signal-flow manner from top to bottom. They are separated in their own window at the bottom, indicating that they are meant to be used on a clip-level, and not tracks, even though they can.

**Functions:** *Standard-* and *Suite-*versions has unlimited audio and MIDI tracks, unlimited *scenes*, 12 send and return tracks, 256 mono input and output channels. For the lower tiers, Ableton limits their number of functions mentioned above, and the number of effects and libraries. The basic GUI and layout stays the same.

**Recording:** *Lite* has only 4 in and out vs *Intro* has 16. *Standard* and *Suite* has 256.

**Editing:** Standard editing tools available, but has an extensive MIDI-plugin library not offered by other DAWs. Also support for extensive automation.

**Main selling point:** Ableton markets themselves as a DAW with endless opportunities, only limited by the creators themselves. Its meant to be a combination between studio-work and live-work. Ableton Live closes the gap

between the produced material and the performances on stage.

#### 4.2.2 FL Studio

**Pricing:** 4 different plans, ranging from €99 to €499.

**Availability:** MacOS, Windows

FL Studio has made ground at DJ producers, and EDM artists since its release in 2000. It was built to be a drum machine, but has evolved into a full fledged DAW.

**Layout:** When first opening the DAW, you are met with lots of buttons and windows. It is the opposite of simplistic design.

On startup the following windows opens:

*Playlist*, where the timeline is found. It is also called *Arrangement* as this is where the project is arranged. *Pianoroll*, a MIDI editor. *Channel Rack*, the drum machine for each clip in *Playlist/Arrangement*.

It is an object oriented DAW, presenting all of the features and functions most of the time.

**Functions:** 125 recordable and mixable tracks. Multiple arrangement views at the same time. A lot of integrated plugins in their top tier version. Very versatile with multiple ways of doing one function.

**Recording:** Even though FL Studio can record multiple tracks at the same time, it's clear that this is not its main functionality. You can choose to record either via a plugin called *Edison* or straight onto the track. *Edison* works as a sampler, and stores the track as a clip. *Playlist* recording works as other DAWs, but FL Studio asks the user to give a new name for each recording.

**Editing:** FL Studio is mainly built for editing samples and MIDI. It offers the same basic editing functionality as other DAWs with fades, automation, splicing. The main difference is that audio editing happens in *Edison*, making it not suitable for multi-clip editing. *Edison* is a destructive editor, meaning choices that you do for a recording or clip will be permanent.

Sequencing on the other hand is what FL Studio is built for. Each sample/clip can be handled/edited on its own, and inserted into the *playlist*.

**Main selling point:** FL Studio does not market itself as a fully fledged DAW, but rather an extension to what you can do with a DJ kit. Their marketing is heavily influenced by popular EDM and hip-hop artists. They offer lifetime updates, and endless creativity.

### 4.3. Mix Centric

#### 4.3.1 Logic Pro

**Pricing:** €199 one time fee

**Availability:** MacOS

Together with Ableton and Pro Tools, Logic Pro is one of the most recognisable DAWs. With a fixed price for their 10th version, it has received free updates since 2013.

Logic Pro can open GarageBand projects, as well as projects all the way from Logic 5.

**Layout:** Carries similar layout as GarageBand, adding more features such as a *Mixer-view*, and more extensive plugin-layout.

Logic Pro also has a feature called *Live Loops* and *Step Sequencer*. When entering this mode, it becomes more similar to how Ableton and FL Studio is in terms of layout and functionality.

**Functions:** Dolby Atmos, up to 1000 stereo tracks, up to 1000 MIDI tracks. 13 000+ Apple Loops.

**Recording:** Support for as many tracks as the computer can handle.

**Editing:** Standard editing tools, as well as time-flex, pitch correction, and extensive automation support.

**Main selling point:** Apples website says "Ridiculously powerful. Seriously creative". Logic Pro tries to be an all around workstation covering most workstation needs. It also "just works" as any Apple product is designed. Their layout is similar to how GarageBand works, making the transition from the pre-installed software on every Mac easy to Logic Pro.

#### 4.3.2 Pro Tools

**Pricing:** \$99 annually /\$9 monthly to \$559/\$89

**Availability:** MacOS, Windows

As the industry standard for post production and mixing, Pro Tools is probably the most used software for professional audio editors and mixing engineers.

For years, AVID has had three versions of the software; a free Intro version, normal Pro Tools and Pro Tools HDX. Now, they have switched to annual or monthly payments offering Intro, Artist, Studio and Ultimate. The main differences between them are feature limitations such as number of MIDI & audio tracks, simultaneous recordable tracks, busses and masters.

Users can become certified through university/collages, or at private institutions.

**Layout:** The basic layout of Pro Tools has stayed the same since its introduction. You have two main views; *Mix* and *Edit*. On the top you will find transport and editing control. The design uses retro imitation to simulate physical knobs and buttons.

**Functions:** 64 simultaneous record inputs, 512 audio tracks, 1024 MIDI tracks, multichannel mixing in surround, Dolby Atmos and Ambisonics.

**Recording:** *Studio* version can only support up to 64 tracks compared to *Ultimate* who can support 256 tracks via Core Audio or ASIO.

**Editing:** As the industry standard for audio editing, Pro Tools has all of the essentials. There are no features that are missing compared to other DAWs in this evaluation.

**Main selling point:** Pro Tools is recognised to be the industry standard recording and mixing workstation. With

their new lineup of version, they are trying to grow their market towards amateurs and semi-professional users as well. Pro Tools sells stability and familiarity.

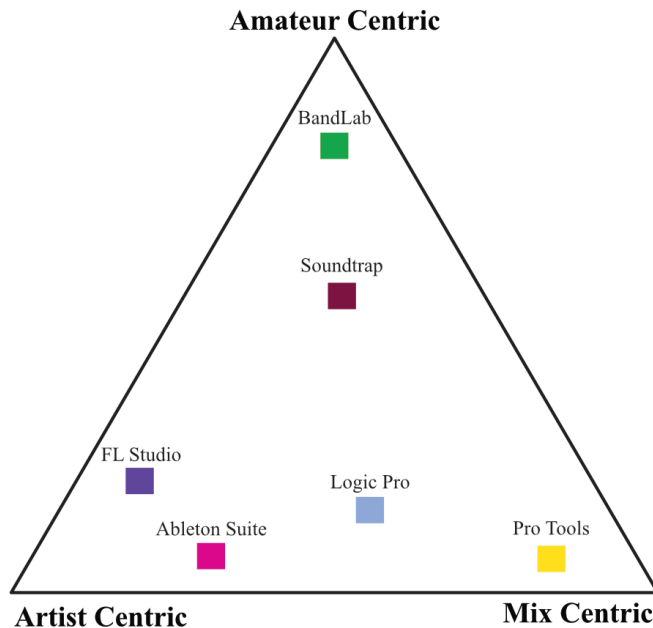


Illustration 1, proposed dimension of DAWs in the categories

## 5. DISCUSSION

FL Studio's sample based workflow is more focused towards an Artist Centric view, with limited recording abilities, focusing on the sampler/sequencer. The workspace is cluttered, and does not follow traditional layout of a DAW. It is more of a creative workspace for music rather than an audio editing workspace.

Pro Tools utilises retro imitation in their design, imitating how analog mixing consoles work. Even though you can record, edit and create MIDI tracks and virtual instruments, its limited to a plugin-based workflow and has a limited selection of instruments "out of the box". Pro Tools specialises in audio-recording and editing, establishing a model of mix-centric workstations.

BandLab has a larger focus on their social network in comparison to their actual workstation. Functionality is limited in comparison to Soundtrap, making it the workstation with the least features in this comparison. Their collaborative real-time system makes sketching with other creators easy. The music created in BandLab has a recognisable sound since all tracks are based on the same constrained library of effects and instruments.

SoundTrap takes the best of BandLab and polishes it into a package with more functionality. It also facilitates a collaborative platform for others to join the project. It is hard to categorise Soundtrap to one category as it does not constrain the user as much as BandLab, and has more features. Their design covers most mixing-needs, but also an extensive MIDI instrument library.

Logic Pro has extensive tools for creative producing of music, but with a mix-centric view of workflow. *Live Loops*- and *Sequencer*- modes tries to imitate workflows made popular by Ableton and FL Studio. As an easy entry point for new users, is categories in between Mix- and Artist centric.

Ableton focuses on virtual instruments and MIDI capabilities. It has support for extensive routing of audio and MIDI. It is not designed mainly for multitrack recording and mixing, rather support for bringing a mix out of a studio environment to a stage, and enlightening creativity by not limiting the user. Therefore is more of an Artist Centric workstation rather than a Mix Centric workstation.

Workstations with pricing tiers offers a lineup of workstations that correlates to some degree with the proposed categorisation. Ableton's introduction workstation tries not to be overwhelming by limiting libraries, compared to top tier workstation - *Suite*. But in reality they have the same layout and structure. The same strategy is not seen in Apples GarageBand vs Logic Pro, and Pro Tools *Intro* vs *Ultimate*, where a lot of essential features are restrained.

It seems like all workstations are growing together into the same products. Each workstations has their own novelty, but for every generation more is overlapping. Pro Tools new lineup of *Artist*, *Studio* and *Ultimate* suggest a renewed idea of how they should act outside of recording studios. Logic Pro tries to capture an essence of each workflow, and Ableton is not longer the only one with MIDI as its speciality. Maybe the reason for a slow evolution is the fear of loosing consumers, and therefore Pro Tools has to split their lineup into several tiers.

## 6. CONCLUSIONS

It is hard to cover the most important features and functions in a short paper, but the features selected here is an attempt to showcase the essence of each workstation.

The three proposed categories of workstations can not be categorised as one or another. Each workstation has their own qualities, which can make them closer to another category. The workstations offering subscription or one-time-fee in different tiers use limitation in features to get their users into their workflow. This correlates to some degree to the proposed categorisation with the lowest tier offering an Amateur Centric design, middle tier offering more Artistic freedom and the top tier giving the user all of the features in a Mix Centric view.

## 7. ACKNOWLEDGMENT

This article has been written as a result of a research internship with the PLATFORM project [10].

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