

### Introduction to Window Management in macOS

#### Mission Control

This is a macOS feature that offers a bird's-eye view of all the open applications.

#### Split View

This allows using two applications in tandem on a single Space.

#### Gestures

Multi-finger Trackpad or Mouse gestures help navigate Mission Control and Spaces.

#### Spaces

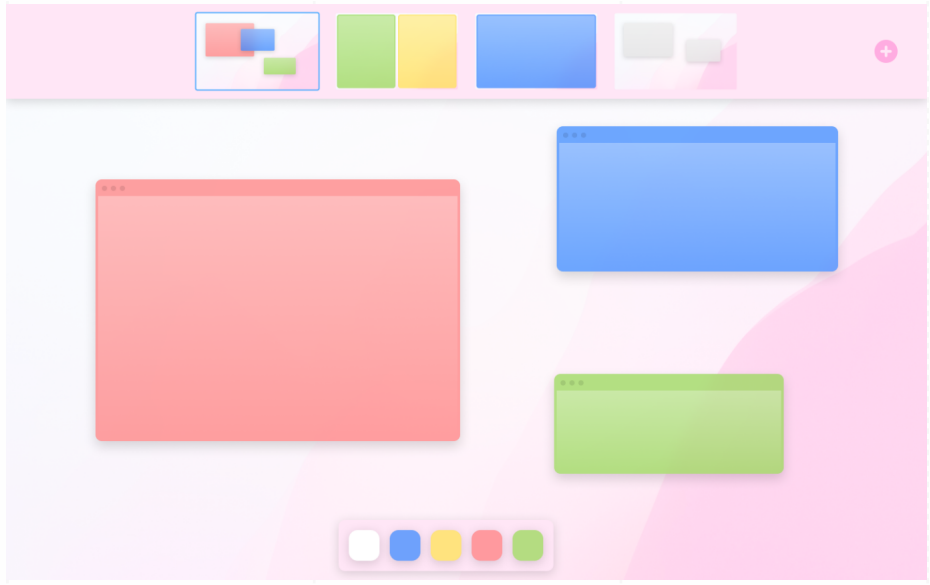
These are virtual desktops that can aid organisation and productivity [2].

#### Full Screen Mode

When a single window is used in Full Screen mode it is assigned to a Space.

#### Shortcuts

Advanced users may utilise custom keyboard shortcuts to edit Spaces.



Representation of the current implementation of Mission Control in macOS

### Observation Study

The window management behaviours of three users were studied through observation. The users had varying proficiency with the macOS operating system. They are referred to as Novice, Amateur and Expert.

The other two had used macOS extensively, but one was more aware about the window management features.

#### Novice

They recently switched to macOS from Windows and were unaware of the concept of Spaces and accompanying gestures. They did not use apps in the Full Screen mode.

They used the Snap feature from Windows 10, but could not find it in macOS. As the desktop got cluttered, they minimised windows around to organise them.

#### Amateur

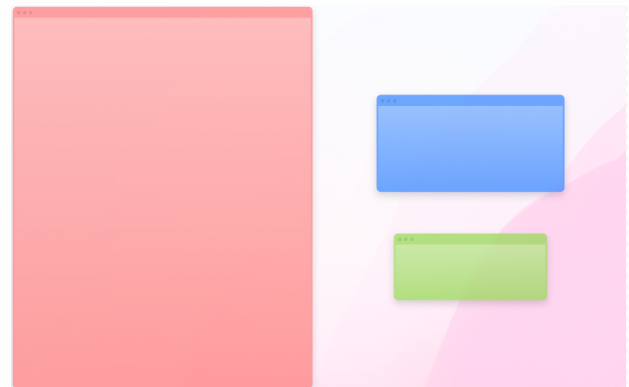
This user had used Mission Control and Spaces. They used gestures to navigate between Spaces and shortcuts to switch between apps.

They did not use Full Screen mode, but placed windows in Spaces. They did not make use of Split View but used randomly placed windows on the desktop.

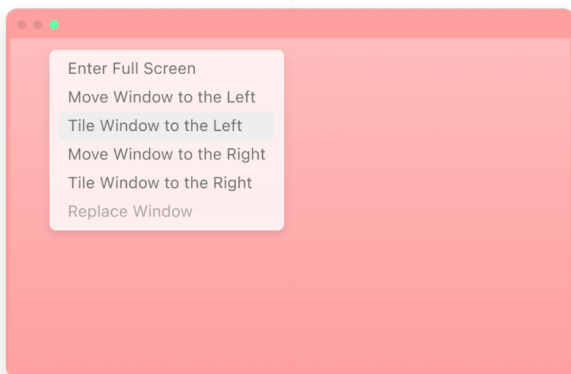
#### Expert

They used Mission Control and regularly edited Split Views. While reorganising windows took them time, it is likely it made them more productive [2].

They destroyed Spaces for Full Screen and Split View and replaced them when editing, which suggests they were unaware of the Replace Windows option.



Picking or Replacing the Right Side app for Split View



The Menu for entering or editing Full Screen and Split View

### Issues with Mission Control

#### Discoverability

Mission Control is easy to discover using gestures or function keys, unlike Full Screen, Split View & Spaces.

To enter Split View, you have to click and hold the Green maximise button. This may hinder discoverability.

#### Editing Split View

The only way to edit a Split View or Full Screen is the menu item. This also suffers from poor discoverability.

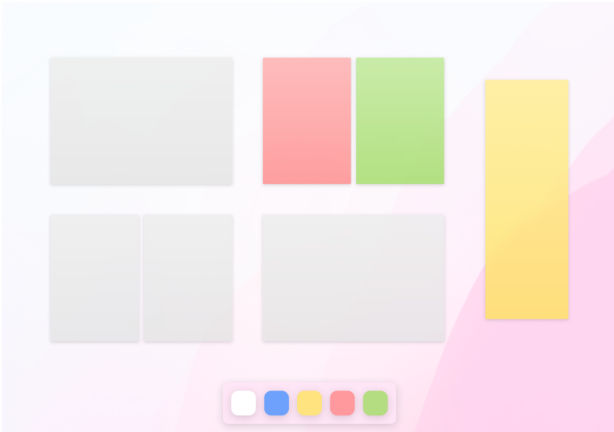
When entering or editing Split View, one can only choose the second window from currently open apps.

#### Consistency

Multi-tasking on iPadOS now has many similarities to macOS, but many features are missing in macOS Spaces.

We will take inspiration from iPadOS and Windows and strive for consistency.

### Inspiration from iPadOS and Windows features



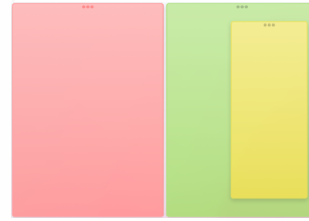
Multi-tasking screen in iPadOS

#### Rearranging Layouts

As compared to macOS, the iPad offers larger previews of each Space.

This is carried forward from its iOS roots, but many Spaces can be overviewed owing to the larger screens.

A huge advantage of this approach is that it facilitates rearranging and management from Mission Control.

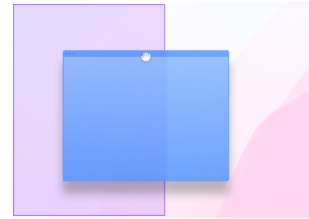


Split View & Slide Over

#### Dragging & Slide Over

Each window in iPadOS can be dragged using the three dots on the "Title Bar".

A third overlay app can be invoked by swiping from the edge of the screen.



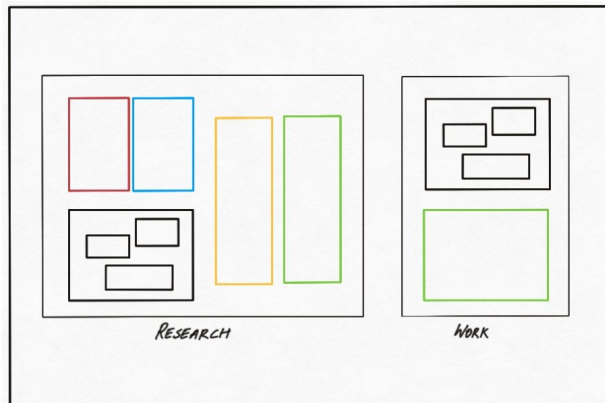
Snapping in Windows

#### Window Snapping

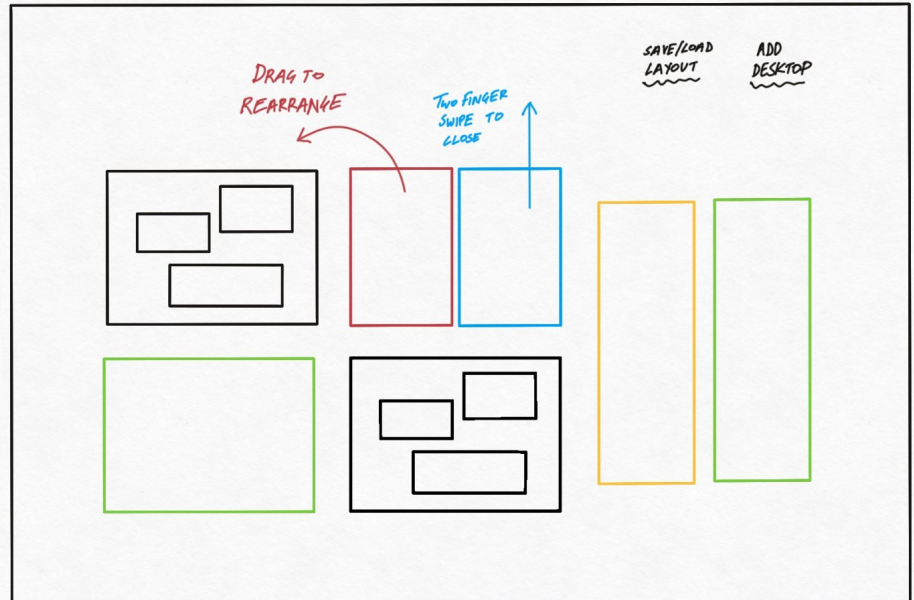
In Windows 11, dragging a window to a side or corner neatly resizes it.

### Low-fidelity Sketches & Ideation

Low-fidelity sketching was used to flesh out and combine ideas from macOS iPadOS and Windows.



Overview of saved Mission Plans.



Initial Idea for Redesigned Mission Control.

#### New Mission Control

In the redesigned Mission Control, each Space is enlarged and presented in a grid structure. Slide Over is brought to macOS and the apps are visible in Mission Control.

#### New Gestures

The apps can be dragged to rearrange the layout and create/edit Split Views and Full Screen.

A two finger swipe is used to close windows from Mission Control.

#### Window Snapping

Windows can be dragged to the to edge of the screen to enter Split View or Full Screen.

#### Mission Plans

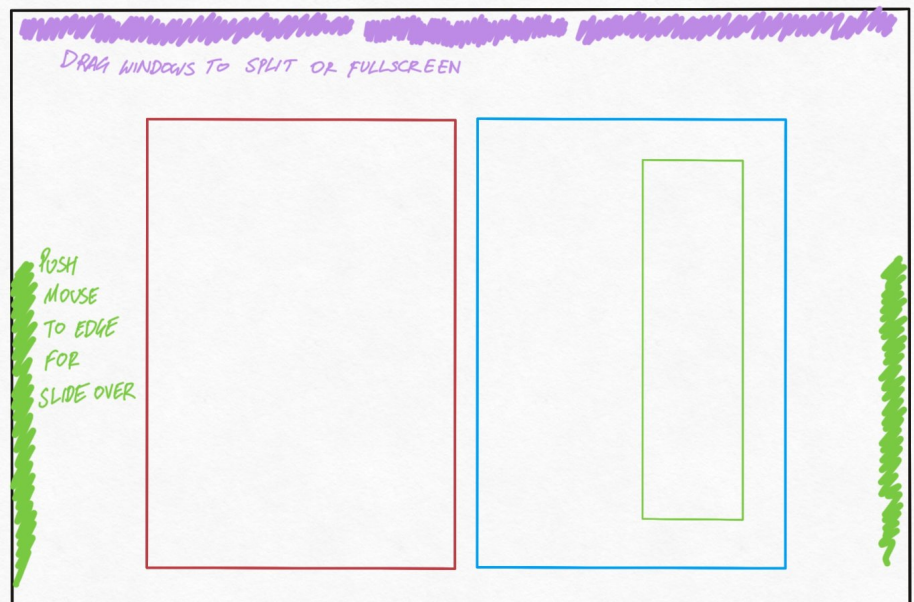
Mission Plans is a concept for saving and loading Spaces layouts. Frequently used layouts can be saved using this feature [1].

This feature can tie in to the newly introduced "Focus" feature, so users' desktops can reflect their work intentions.

#### Preserving Functionality

Dragging to the side edges allows you to move windows between Spaces. This is why top edges are used for Snapping.

Dragging to the top edge with a higher velocity invokes Mission Control.



Mouse hotspots for Snapping.

## Creating Split Views or Full Screen Spaces

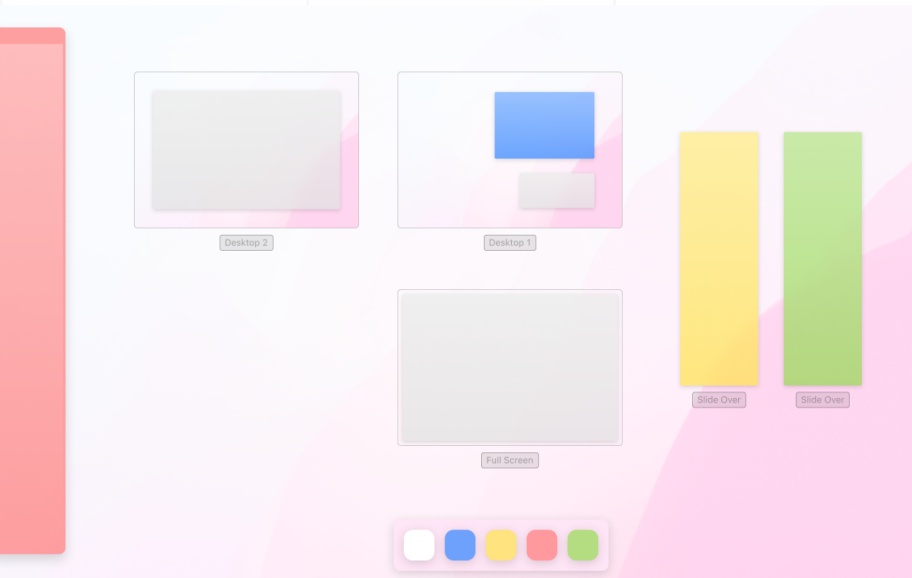


Split Views and Full Screens can be created by dragging an app to top edge of the screen.

The purple bars move and scale, providing feedback of the selected action — pin to left, full screen or pin to right.



When an app is already in Full Screen, moving the pointer to the green areas will invoke a second app for Split View (top) or a Slide Over app (sides).



A familiar Mission Control layout for picking the Right-hand app for a Split View.

## Picking the second application

The redesigned Mission Control is available for picking the second app. Any app — whether it is on any desktop Space, in Full Screen mode, or open in Slide Over — can be selected from this view.

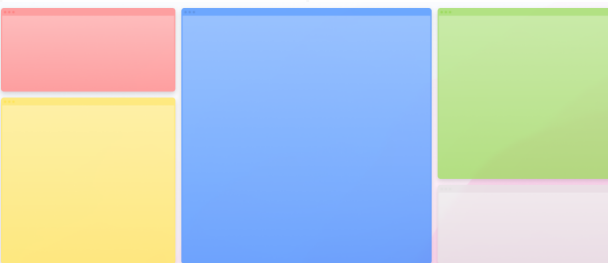
Compared to the existing implementation on macOS, this requires a lot less planning as the app does not need to be open on your current Space.

Crucially, the Dock is available in this view. When used in conjunction with Launchpad, any app can be opened from here.

## Complex Layouts

Split View could optionally be used to create several splits on the screen for more complex layouts.

This would be especially useful as an advanced feature for Ultra Wide monitors.



Multi-split View on Ultra Wide screens.

## Using the Split View

When in the Split View, the apps can be resized or swapped just like the current implementation. Slide Over apps can be dragged over to replace the Split view apps.

When there are multiple apps in Slide Over, they can be swiped between using the usual Mission Control gesture, just when the Mouse Pointer is on the Slide Over apps.



The final Split View with multiple Slide Over windows.

# New Mission Control, Gestures and Preserving Functionality

## Overview of the redesign

All windows in each Space are visible and spaced out, allowing them to be dragged and rearranged easily.

Windows can be closed using a two-finger swipe, to help organise window clutter at the end of the day.

The current Spaces layout can be saved as a Mission Layout, and loaded as needed from mission control.

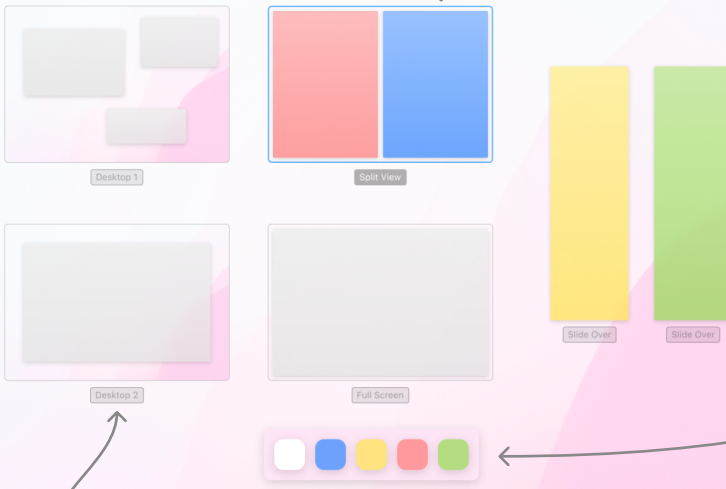


Overview of saved Mission Layouts.

Saved Mission Layouts can be browsed and named. The configuration of "Focus" profiles can be connected to Mission Layouts.

Slide Over apps are laid out beside the Spaces. This helps maintain consistency with the presentation in iPadOS.

Just like iPadOS, icons from the Dock or Launchpad can be dragged into Mission Control to open app windows.



The redesigned Mission Control.

Prominent name tags can help organisation by aiding quick renaming of Spaces through a Double Click.

## Preserving the Bird's Eye view

Mission Control Bird's Eye view was used to switch between windows on a cluttered desktop. While the new features can help prevent clutter, the Bird's Eye view functionality is maintained with a swipe-and-hold gesture.

Users can be allowed to swap the views invoked by the gestures.

Three finger Swipe

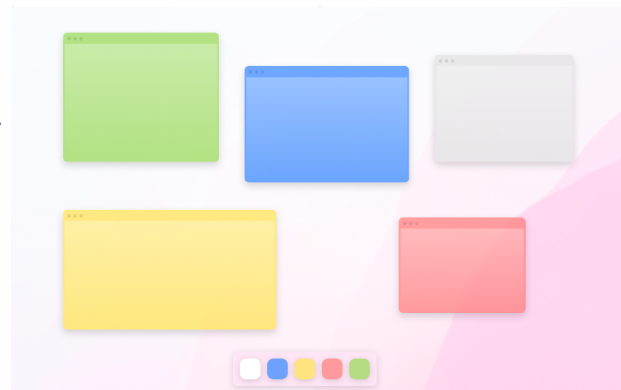
Three finger Swipe and Hold



Cluttered desktop with several windows.



New Mission Control



Old Mission Control Bird's Eye view.

### Basic Loop Pedal Controls

A Loop Pedal is a device used by live musicians to layer multiple recordings of their voice or instrument.

It is a tool used by individuals to bring band-like complexity to a solo performance.

The Zoom G1on [6] is an Effects Pedal which includes a Single track Looter.

#### Left Foot Pedal



Press to start the recording.



Press again to loop the sound that was being recorded.

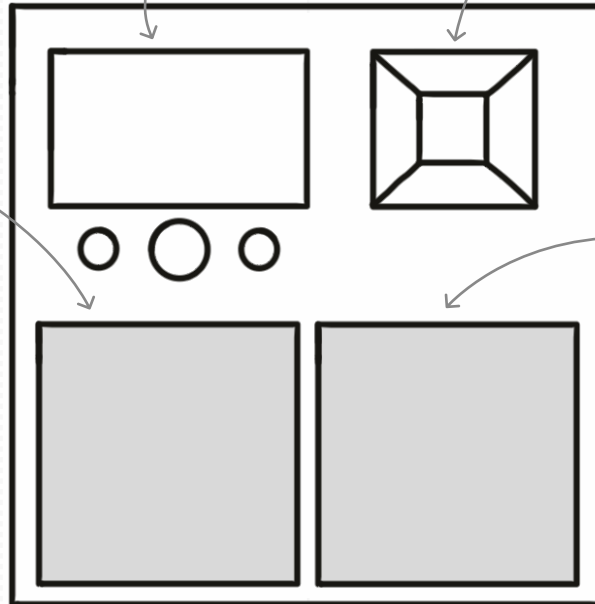


When looping, Press again to Overdub or layer over the recording.

The screen is used to convey system status and the progress through the recorded loop.

There are several buttons used to control the effects available in the pedal.

These buttons are small and require the use of your hand.



#### Right Foot Pedal



Press to stop the recording.



Press and hold to Clear the recording.

A representation of the Zoom G1on Effects Pedal.

### Multi-Track Looping

A Multi-Track Looter allows for multiple parallel tracks, which are individually controlled. Using multiple tracks, the musician gains greater flexibility to conduct the highs and lows of a performance.

It usually requires specialised hardware with more than two foot pedals to switch between tracks. In this project, I will reimagine the controls to be able to support multi-track looping using just two foot pedals.

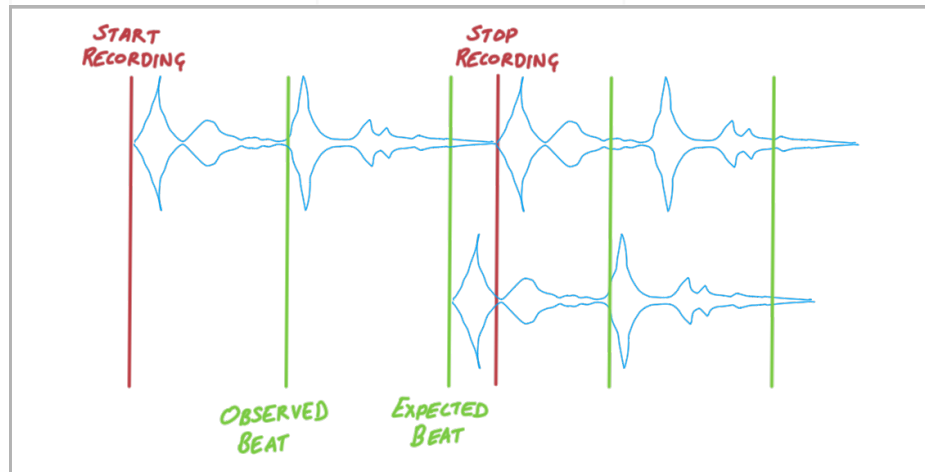
### Visual Abstracts for Quantisation

In this section, two types of Quantisation are defined and presented using Visual Abstracts. This is done to get a sense of the value of Quantisation for a Live Looter.

#### Loop Quantisation

This entails analysing a recording to predict the tempo and corresponding beats. This can help make a loop more accurate by correcting for any user-caused delays in looping.

By adjusting the loop to an algorithmically "Expected Beat", the resulting loop can be more pleasing by avoiding repetitive beat misalignments [3].



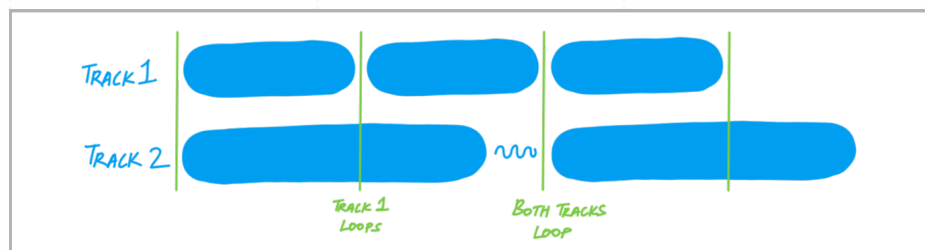
Loop Quantisation.

#### Track Quantisation

In a Multi-Track Looter, slight delays in starting or ending recordings can lead to the tracks misaligning. Over time, this effect compounds leading to incoherent sounds.

Track Quantisation prevents this by adjusting for any such delays. All tracks are adjusted to be a multiple of the initial loop.

Musicians can also leverage this to make recordings of differing bar lengths or time signatures.



Track Quantisation.

### Redesigned Multi-track Controls

#### Left Foot Pedal



Press to start the recording.



When looping, Press again to Overdub or layer over the recording.



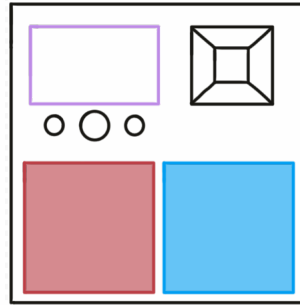
When a track is stopped, press and hold to clear it.



Press again to loop the sound that was being recorded.



When playing, Press and Hold to undo/redo the last Overdub.



Redesigned Multi-Track controls for the Zoom G1on Effects Pedal.

#### Right Foot Pedal



When playing, Press to play or stop the current track.



Press and hold to cycle between tracks.

#### Both Pedals Pressed Together



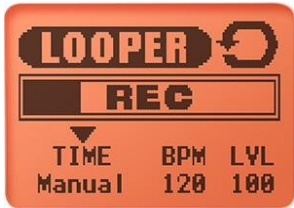
Press and hold to stop all playing tracks.



When stopped, Press and hold to clear all tracks.

### Redesigning the Looper Screen Layout

The UI of the Looper is redesigned to support Multi-Track functions. The simplicity is maintained to suit a low cost LCD screen.



Original Looper UI on the Zoom G1on.

Progress indicator for Press and Hold actions.

Universal recording/overdub status indicators.

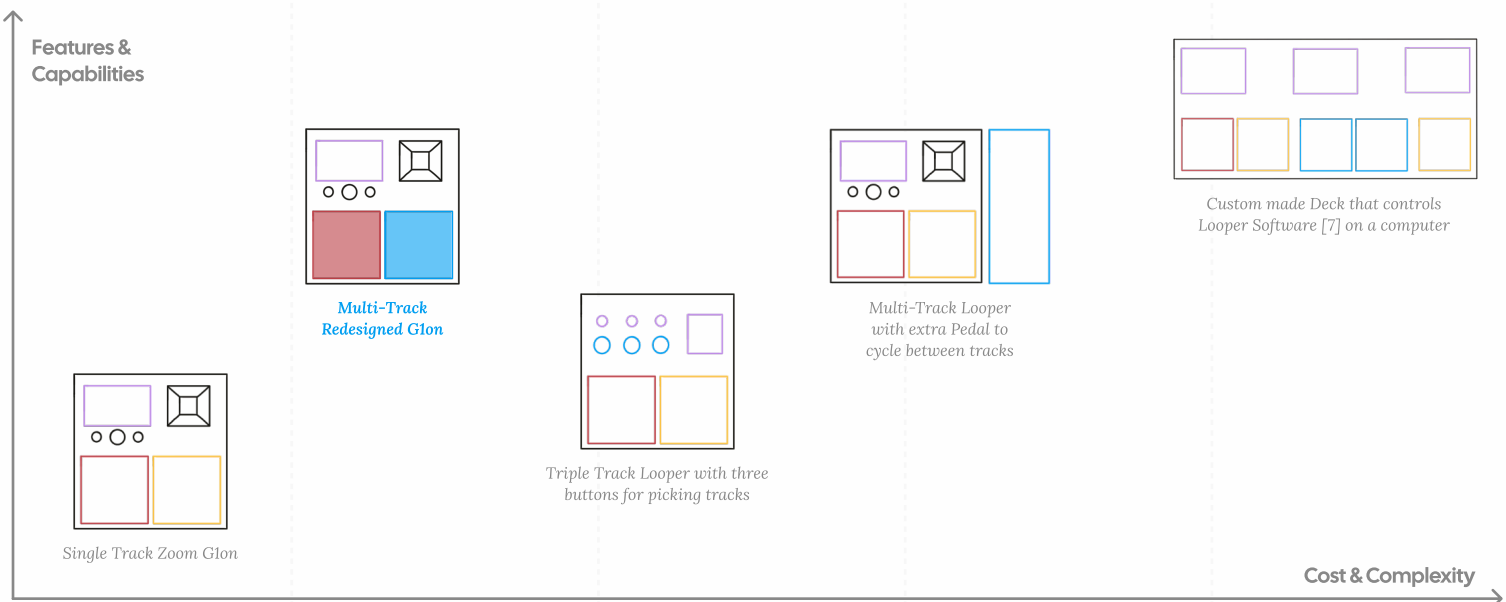
Vertical layout of additional options controlled by the smaller buttons.



Redesigned UI for Multi-Track Looping.

Selection and playback status for multiple tracks including their relative lengths.

### Comparing Looper Designs



### The Concept

Inspired by the Workout app, the E-book Companion is a concept to use a Smart Watch as a remote and status indicator. It is intended to be used with an E-reader, Tablet or Computer.

This concept can aid posture during long reading sessions by alleviating the need to hold the reading device. However, this companion only makes sense if it is feasible to mount the reading device or place it on a desk.

#### Watch Crown

The Primary Interaction of the E-book Companion is using the Watch Crown as a Scroll Wheel when reading.

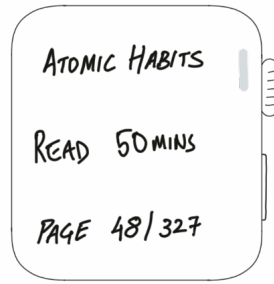
During long reading sessions the companion allows users to rest their arms.

#### Progress Indicators

The current Page Number and Progress are available when the Smart Watch screen is turned on.

The Reading Time is also displayed along with the current time.

### Initial Sketches



Basic text-based layout with a Scroll Indicator.



Fleshed out Scroll and Progress Indicators.



Added Bookmark button and Indicators

### High-Fidelity Prototype

High-fidelity mockups were made for the Main Screen as well as the Bookmarks page.

Some refinements were made to the design, including applying the UI Design Principles for the Apple Watch, such as including the time and Cancel button at the top of the screen.

#### Circular Progress Ring

The Page Number Progress is indicated using a Ring similar to the Activity Rings on Apple Watch.

#### Scrollbar Design

Pages are clumped into lines on the Scrollbar, with a Yellow highlight indicating the scroll position. Red lines indicate the presence of a Bookmark.

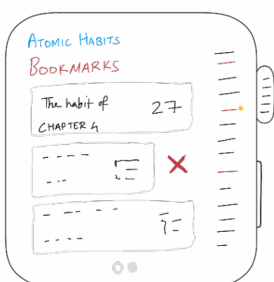


High-fidelity Prototype.

### Bookmarks Page

Pages can be Bookmarked from the Smart Watch. The Progress Indicators highlight bookmarked sections.

The Bookmarks page lists all bookmarks. It is accessible using a swipe, similar to the layout on the Workout app.



Bookmarks page Initial Sketch.

#### Navigating the Book

Tapping on a bookmark skips to that page on the E-reader.

The list shows the page number and chapter number for the bookmarks, as well as some text from the page.



High-fidelity Bookmarks page.

#### Managing Bookmarks

A bookmark can be swiped to reveal a delete button.

Bookmarks can easily be managed and organised from this page.

### Current Flow on Apple Pay

At the POS, the appropriate card is selected from a list, and then the device is held near the card reader.

#### Feedback on Success

In the current implementation of Apple Pay, the screen indicates successful payment using a "Done" graphic and a wrist tap or a beep.

Only the success of the payment is indicated on the screen. There is no indication about the amount that is paid or the vendor to which the payment is made.

#### Implications of Poor Feedback

A study by Paymentsense revealed that many people fail to check the amount displayed on the card reader [5]. This can lead to accidental or malicious overcharges.

Another study found that people were willing to pay larger sums using Debit Cards as compared to Cash payments [4]. This decoupling from the physical nature of Cash also occurs with Contactless payments. Instant Feedback about payment amounts could help users better control subsequent expenses.



Card selection and tap.

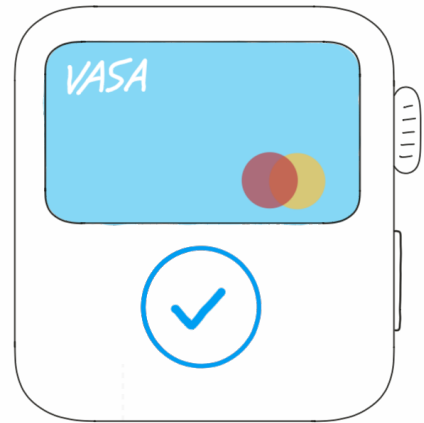


Feedback on successful payment.

### Redesigning the Flow

When the haptic feedback or beep feedback catch the user's attention, this additional screen is shown. This screen can also be shown on the Smartphone, as the layout is fairly similar.

The amount paid is shown in large text to catch the eye. The vendor name is also shown on this screen to protect against Man-in-the-Middle attacks.



Redesigned success screens with transaction information.

### High-Fidelity Prototype



Redesigned feedback screen.

#### Report Disputes

A Report button is added so users can instantly raise a dispute with a payment.

#### Amount & Vendor

The paid amount and the vendor name is indicated on the screen.

### Transaction History

Apple Pay provides a list of the latest transactions within the Wallet app. A banking application can also be used to find this information.

However, this feedback requires an additional step and is not instant.



Transaction History on Apple Pay.



### Introduction

This is the story of my colourful relationship with the kitchen tap pictured below.

### Affordances & Discoverability

While a tap is not really an interface, the inherent interaction provides a great opportunity to think and learn about affordances and discoverability. These aspects in the hot water mixer and the pull-down hose will be explored.

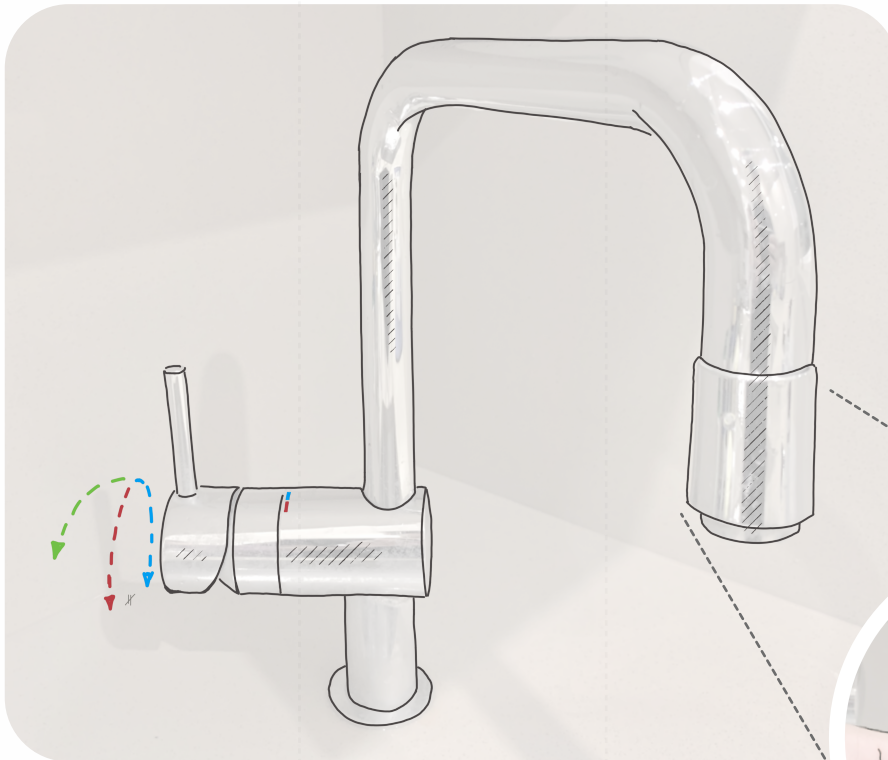
## Critical Analysis

### Mixer Lever

The lever is **tilted to the left** to turn on the water. The lever is used to adjust water temperature as **pull:hot** or **push:cold**.

An issue arises when opening the tap in a hurry, a common occurrence in the fast-paced kitchen environment. When stretching to reach for the lever, it is very easy to **pull** it and inadvertently burn your hand.

It is important to note that this issue may affect people differently depending on their preferred hand. When using the tap Right-Handed, you tend to reach further out while trying to avoid the path of the water. This may contribute to the tendency to **pull**.



Overlay Sketch of a Kitchen Tap.

### Pull-Down Hose

On this tap, the end can be **pulled downward**, to reveal an in-built hose. This is a delightful extension of the functionality of the tap.

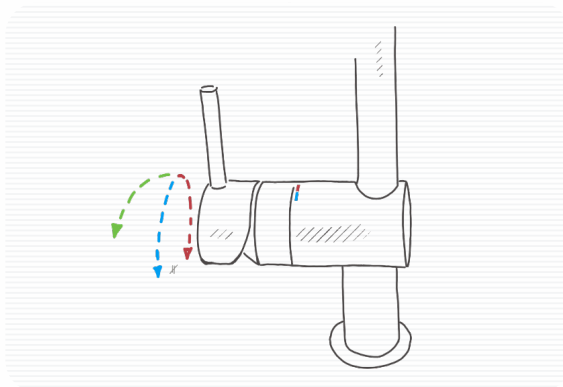
However, it is not immediately clear that this functionality exists. While it is possible to advertise this feature through the manual or the packaging, these items are not always available.

This issue may arise for someone not familiar with the tap, such as in a common kitchen at work.

## Ideation Sketching for the Mixer Lever

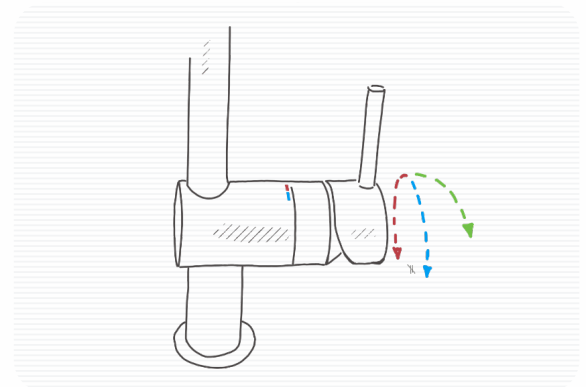
Relatively simple adjustments go a long way in addressing the mixer problem.

We will look at two such potential improvements and illustrate them using sketches.



### Reversed Mixer

If the lever is inverted to function as **pull:cold** and **push:hot**, the accidental hot water activation can be reduced.



### Rotated Installation

Instead, the tap could be rotated during installation, which would be a much simpler fix.

It would help to consider the user's preference about the **lever side**.

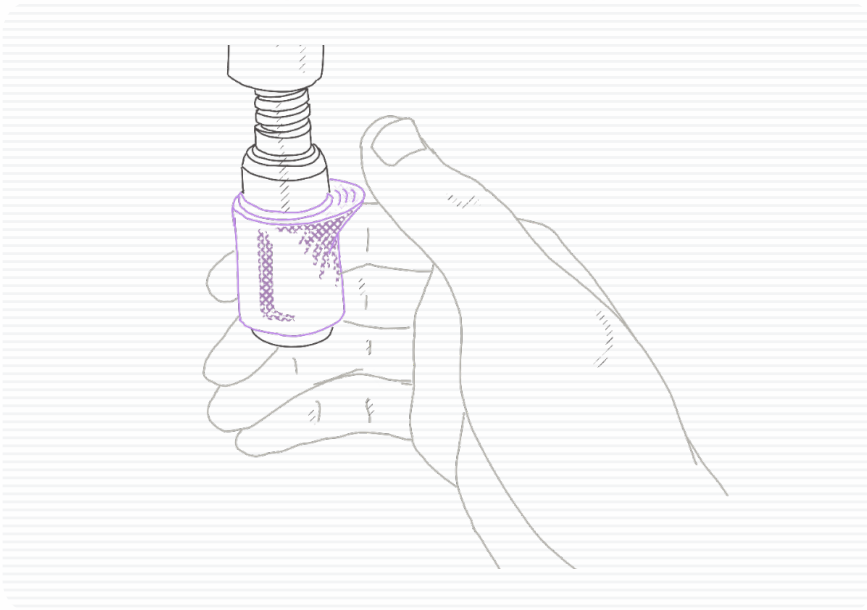
## Ideation Sketching for the Pull-Down Hose

We can use affordances in the design of the spout to ensure this useful and likely expensive feature doesn't go unnoticed.

### Pull-Tab and Grip

It would be ideal if the hose functionality could be communicated purely through the form of the tap. This is achievable by adding a **pull-tab** shape to the end of the tap.

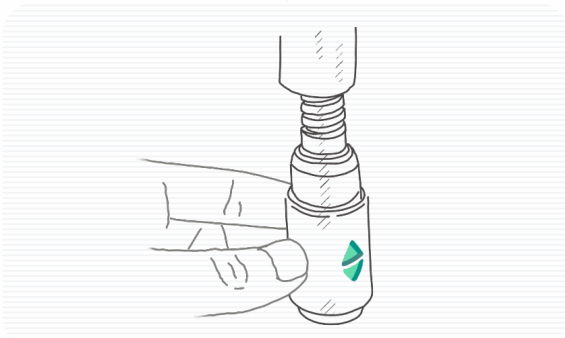
The **ribbed-grip** on the tab invites the use of the thumb, which facilitates discovery.



Using the pull-tab on the spout.

## Alternate Ideas for the Pull-Down Hose

We now consider some simpler additions to the spout that may make a cheaper-to-manufacture discoverability affordances.



### Up-Down Arrows

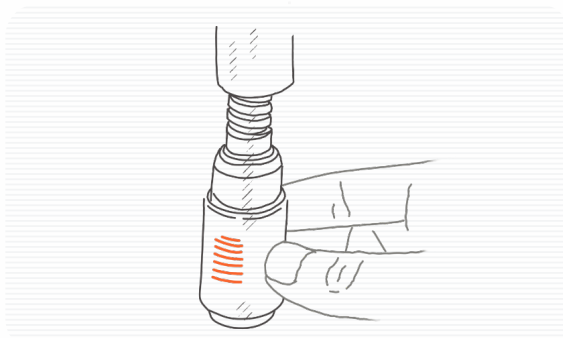
Here a simpler redesign is explored, which uses **up-down arrows** to indicate that the end of the tap can move.

The arrows can be debossed to draw attention through touch.

### Ribbed Grip

Yet another simple fix would be to finish the end of the tap with a **ribbed grip**.

At the very least, this would encourage discovery as the user would be inclined to interact with the part.



A measuring tape with a pull-tab.

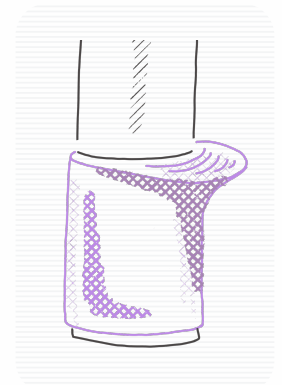
### The Inspiration

Measuring tapes have a **pull-tab**, that makes the tape easy to pull out.

### The Grip

The redesign provides an opportunity to replace the metal end with **rubber** or **soft plastic**.

This could not only make the **pull-tab** easier to manufacture, but also provide additional grip when using the hose.



Redesigned spout with a pull-tab.

## References

- [1] Kévin Eugène. 2018. Redesigning the macOS desktop experience. Medium. Retrieved January 10, 2022 from <https://uxdesign.cc/my-attempt-at-redesigning-the-desktop-experience-macos-case-study-99f5f2fb3b10>
- [2] Meredith Ringel. 2003. When one isn't enough: an analysis of virtual desktop usage strategies and their implications for design. In CHI '03 extended abstracts on Human factors in computing systems - CHI '03, ACM Press, Ft. Lauderdale, Florida, USA, 762. DOI:<https://doi.org/10.1145/765891.765976>
- [3] Daniel Rudrich and Alois Sontacchi. 2017. Beat-aligning guitar looper. In Proceedings of the 20th International Conference on Digital Audio Effects (DAFx-17), Edinburgh, UK, 5-9.
- [4] Emma Runnemark, Jonas Hedman, and Xiao Xiao. 2015. Do consumers pay more using debit cards than cash? Electronic Commerce Research and Applications 14, 5 (September 2015), 285-291. DOI:<https://doi.org/10.1016/j.elerap.2015.03.002>
- [5] Are you being short-changed? 1 in 3 of us have no idea. Retrieved January 10, 2022 from <https://www.paymentsense.com/uk/blog/are-you-short-changed/>
- [6] G1on. Zoom. Retrieved January 10, 2022 from <https://zoomcorp.com/en/us/multi-effects/guitar-effects/g1on/>
- [7] Mobius Looper. Circular Labs. Retrieved January 10, 2022 from <https://www.circularlabs.com/>