

DEPLOY MACHINE LEARNING WITH TENSORFLOW.JS

The voice of web design

net

Issue 308 : August 2018 : net.creativebloq.com

* DESIGN PROCESSES

AMP UP YOUR AGILE DESIGN

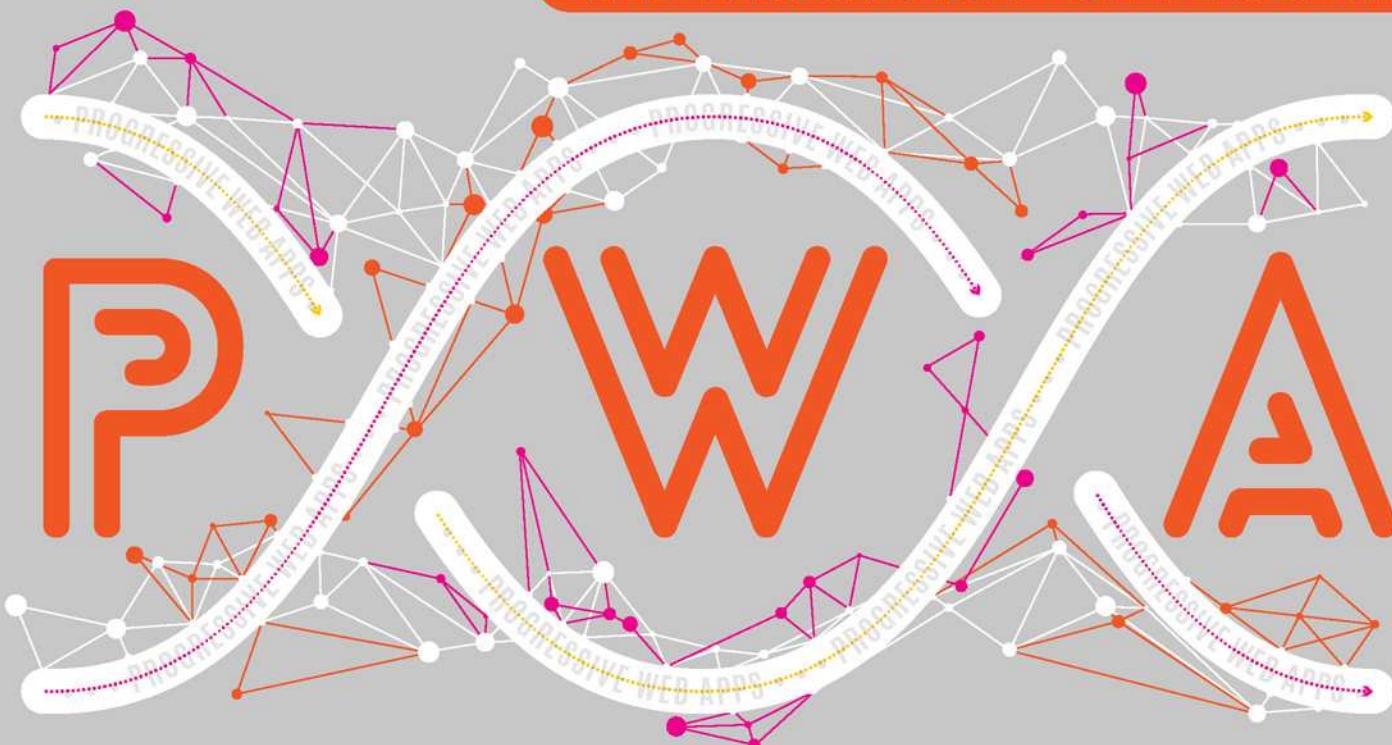
Stay lean, keep iterating and be nimble

→ WELCOME TO THE

MOBILE EVOLUTION

→ HOW TO UNITE APP AND

WEB DESIGN SEAMLESSLY TOGETHER →



- GET AHEAD WITH A HEADLESS CMS
- BUILD UPON OLD ARCHITECTURE
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★ WELCOME

EDITOR'S NOTE

► No matter how rapidly technology has developed, web design has never struggled to meet the changing nature of the digital landscape. Driven both by opportunity and necessity, those working in the industry have always eagerly met changes in their environment. Whether it's reacting to the demise of Flash by shifting to HTML5 or meeting the shift to mobile by embracing responsive design, devs and designers never shy away from colonising new niches.

That's why this issue we've been looking at how design is evolving and the things devs and designers can do to ensure they remain at the forefront of the

ecological arms race. Maximiliano Firtman takes a naturalist's eye to the subject of mobile design, exploring the evolution of progressive web apps and showing how they're uniting web and app design.

But adaptability won't just help you dominate the mobile ecosystem. We also take a look at how agile design can help you adapt your product to fit the changing needs of your market and remain nimble in the face of shifting consumer demand. And with the recent release of TensorFlow.js, we explore how devs can use in-browser machine learning to create sites that actively evolve the more users they encounter.

Enjoy the issue!

FEATURED AUTHORS

MAXIMILIANO FIRTMAN



Author of many books, including *High Performance Mobile Web*, Maximiliano is a frequent conference speaker and trainer. On page 60, he explores how progressive web apps are changing the nature of design.

t: @firt

DANIEL SCHUTZSMITH



Daniel is digital technology director at the Natural Resources Defense Council. He discusses the benefits of limbering up and getting agile in your design processes on page 68.

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DARRYL BARTLETT



Darryl is a front-end developer specialising in JavaScript, PHP and mobile. On page 76, he explains how you can build an in-browser image-recognition algorithm.

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AHMED ABUEL GASIM



Ahmed is a front-end developer for Potato London with expertise in CSS, JavaScript and Angular. He offers up a guide on page 92 for creating quantity-specific CSS styles and layouts.

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* REGULAR

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EXCHANGE

Send your questions to netmag@futurenet.com

Practical
advice from
industry experts

THIS MONTH FEATURING...

SARAH DOODY



Sarah Doody runs her own UX design consultancy based in NYC. She is also the founder of The UX Notebook. Learn more at www.theuxnotebook.com

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JIM BOWES



Jim is the CEO and founder of Manifesto, an award-winning agency of creatives and technologists who

collaborate with exceptional organisations to change things for the better. He also presents the @Alexa_Stop podcast.

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★ QUESTION OF THE MONTH

How transparent should you make the UX process to the client? Do they need to know and see everything or just the answered hypothesis?

Dave Maran, Chesterfield, UK

SD: Depends on the client. When I start a new project, I have a meeting to make sure the client understands the process. This shows how important it is for them to provide timeline feedback, which is often a reason for projects going over their timeline.

As for showing them every sketch, whiteboard or iteration of a wireframe, I generally do not show every single step. But as a designer, I do save everything.

Sometimes a client will challenge you on a design or want you to implement their idea. In the event you don't agree with what they're asking, you can refer back to the previous ideas to show them how you arrived at your solution.

This doesn't always result in the client agreeing with your direction. But at least you've been able to build a case and justify how you arrived at your design decisions.



It's not always necessary to show the client every single step of the UX process but they should have the opportunity to refer back to each stage if needed. Illustration: Neil Stephens (www.crayonfire.co.uk)

Design work

OPPORTUNITY OR DISASTER?

Is machine learning going to put web designers out of a job or create more?

Paula Stanthorpe, Norwich, UK

JB: In the near-term, machine learning is definitely going to create more jobs

for web designers and developers.

Amazon recently launched its AWS DeepLens camera, which puts the ability to build video-based, deep-learning models in the hands of a much broader audience. TensorFlow has recently released a JavaScript SDK that will



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AWS DeepLens helps put deep learning in the hands of developers, literally, with a fully programmable video camera, tutorials, code, and pre-trained models designed to expand deep learning skills.

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Amazon's AWS DeepLens camera helps you learn the basics of deep learning; a machine-learning technique that uses neural networks to learn and make predictions

enable a larger audience to start building machine-learning models. However, this type of work will require new skills in data science and mathematics to come into the web design process. Jobs will absolutely be affected by this technology and some will be lost but in the short- to medium-term I think these changes will predominantly affect other types of work.

Redesign projects

LEARN FROM HISTORY

For a small website redesign project, what research methods could/should a freelancer use to make informed decisions to create the best design for clients' users?

Darinka Kostelnik, Slovak Republic

SD: Since this is a redesign, this means there are (hopefully) existing analytics. Once you understand the client's goals for the website, look at the analytics to determine how the website may have been impeding those goals. It's also important that you go beyond the numbers because numbers and analytics don't tell you WHY.

Make a point to do some usability tests with users. Watch them do certain tasks on the website. Also, ask the customer service team what common questions come through the support or contact form on the website or through social media.

Business of design

IS BIGGER BETTER?

As web design becomes more and more complex, are digital agencies going to have

to get bigger and bigger if they stand a chance of being able to compete?

ML, Southampton, UK

JB: I don't think so. I think it's some of the largest digital agencies that have the biggest challenges right now. As we start to incorporate AI, automation and machine learning into our workflows, I think the ability for smaller organisations to compete with larger ones will increase.

Development

TEAM WORK

At what point in the development of a product would you start to include engineering people?

Albino Tonnina, London, UK

SD: You should include members of the development team ASAP. It's crucial to get their feedback early in the process because it will help ensure there are no assumptions about what's possible. Too often, I've seen a product design team create a great concept that the tech team can't deliver within the timeline.

It's also important to get their feedback early because they may have great product ideas for you. Many developers I've worked with have been really good at empathising with the user and identifying useful features or improvements to user flows.

Collaborating with development teams early also sets a positive tone from the start of the project. This makes it easier to have those inevitable tough conversations and compromises later during the project's life cycle.

3 SIMPLE STEPS

Apart from your own podcast, Alexa Stop!, what other podcasts would you recommend to other web designers?

Dan Evans, Dublin, Ireland



+ JB: Sam Harris's Waking Up podcast (<https://samharris.org/podcast/>) covers science and tech. It's especially amazing because of the guests who take part. Almost tech, but actually more science, is The Infinite Monkey Cage (<https://www.bbc.co.uk/programmes/b00snr0w/episodes/downloads>) with Professor Brian Cox and Robin Ince, which is well-informed, intelligent and fun.



+ Other podcasts I highly recommend are the long-running industry news podcasts from Leo Laporte, This Week in Tech (twittv/shows/this-week-in-tech) and This Week in Google (twittv/shows/this-week-in-google).

+ As a true crime junkie, I love Serial (serialpodcast.org) and S-Town (sttownpodcast.org). Whenever I'm travelling I listen to Adam Buxton's podcast (<http://adam-buxton.co.uk/podcasts>) because they're always really entertaining with great guests having a relaxed chat.

COOL STUFF WE LEARNED THIS MONTH

GRID TO FLEX

+ If you want to use CSS Grid but need to support IE11 and Edge 15 and below, try this site from Una Kravets that provides Flexbox fallbacks for several examples of layouts and components. This means you can progressively enhance and get them working for the older browsers.

<http://www.gridtoflex.com/>

SCROLL TO THE FUTURE

+ Dealing with scroll bars can be a messy business, not to mention complicated and frustrating. This great article explores the issue in detail, exploring and explaining the most elegant options for different browser versions and operating systems, so you can make sure you're using the best solution for your needs and making the experience as smooth as possible for your users.

<https://netmag.2l0gj0i>

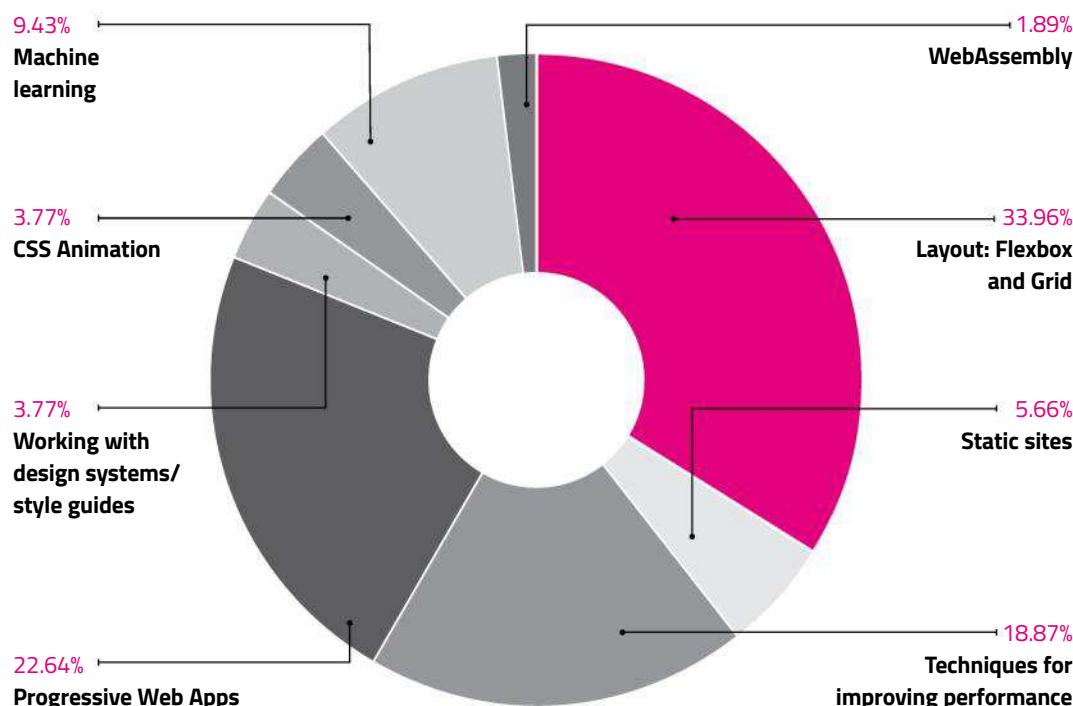
WHY YOU SHOULD BE USING FIREFOX

+ Chrome has been the browser of choice for most developers for some time now but this article makes a compelling case for switching to Firefox: we're told it's faster, leaner, uses less memory and DevTools is loaded with lots of exciting new features.

<https://netmag.2luExu8>

*THE POLL

WHICH WEB TECHNOLOGIES ARE YOUR TOP PRIORITY FOR LEARNING?



From our timeline

What are the best new web tools you've discovered recently?



Deploying sites directly from @github / @Bitbucket with @deployhq - ❤ it!
[@wiegimania](#)



CodeAnywhere.com is really good for web development from any computer.
 [@_LeonBrown](#)



I discovered @jekyllrb and @GoHugoIO recently. It's going to make rolling out and updating

documentation sites and our software development blog a snap! Plus, it's far more secure than WordPress.
[@IndependentSw](#)



You should totally check out @SolisForMac, it lets you preview HTML, CSS, LESS and SCSS on multiple viewports.
[@NormSheeran](#)



After using it personally for a while we've just started rolling out

@LastPass to the whole team. Stops you using the same old password that everyone knows!!
[@bopgun](#)



Gatsby, @gatsbyjs. Creating a static website has never been so easy and pleasant.
[@AurelioDeRosa](#)



imageoptim.com shrinks images sizes and increases page speeds.
[@gramatter](#)



One can use transfer.sh for easy file-sharing right from command-line or using browser.
[@YogeshBang](#)

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THIS MONTH FEATURING...

CLIENTS FROM HELL 14

This month a web developer learns why fellow devs make the absolute worst clients



BEYOND PIXELS

Darrell Estabrook explains how an analogue skill like woodworking can help you fashion a digital career

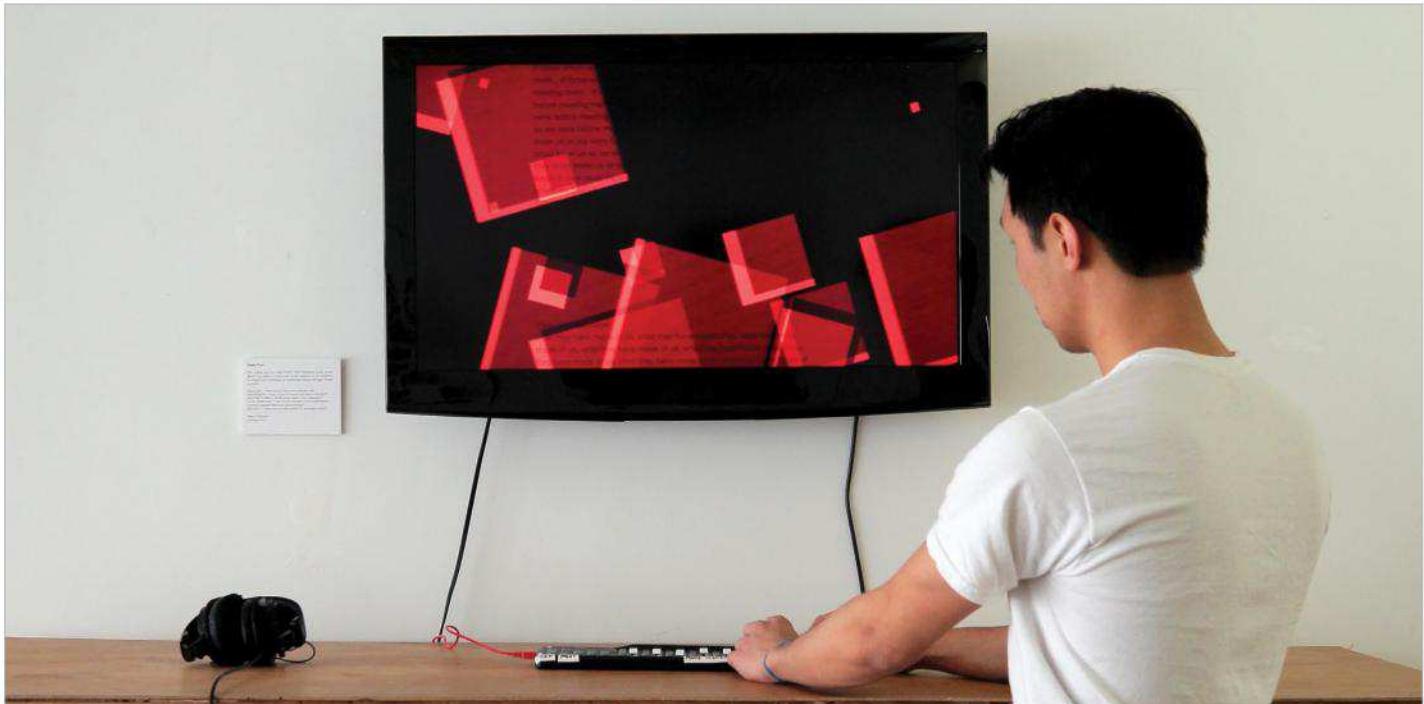
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WORKSPACE

Liz Morrison reveals how communication apps and high-calibre caffeine give Remote an edge

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REALLY FROM

Sean Catangui tells us how he struck a chord with his Paper.js audiovisual project

* SIDE PROJECT OF THE MONTH



SEAN CATANGUI

job: Sean is an artist who works primarily with graphic design and computer programming. His practice aims to explore the boundaries of digital and generative art.

w: <http://reallyfrom.com>

t: @_catangui



Tell us what Really From does

Really From is an interactive audiovisual album. It's sorted into five pieces that each consist of interactive generative animations and a song. Rather than have the audio influence the visuals, I invite the user to 'dance' along and control what they see with either a mouse or a MIDI controller.

Why did you create it?

This project was an opportunity for me to explore my full range of artistic expression – my background is equal parts music (jazz saxophone and piano) and mathematics. Visually I was very inspired by Oskar Fischinger and conceptually I wanted to emulate Beyoncé's *Lemonade* and Frank Ocean's *Endless*.

As a result, Really From is an exploration of my personal history. The title is inspired by the question often posed to Asian Americans: "No, where are you really from?" Every piece is a response to that.

What were you hoping to achieve?

I wanted to create a piece of art that communicated thoughts and feelings I've had about my cultural

identity for the past few years. These ideas sat in areas of ambiguity so I thought randomised algorithms and analogue controls were the best way to express this.

My secondary goal was to showcase how the browser could be a place for art that asks you to take your time. My hope is that more projects like this can be a way for people to live with visual/interactive art in the same way that they can live with music – wherever they go.

What technologies were used in building it?

In an effort to keep the project lightweight, I almost exclusively used Paper.js, an open-source framework that runs on top of the HTML5 Canvas, for the visuals. For one piece, which features breath-like motion, I used Matter.js to implement a particle system. For another piece I used SVG filters to achieve a painterly blur effect.

How has it been received?

I was very happy with how people, especially people of colour and children of immigrants, have identified with it emotionally. I showcased the project at the School for Poetic Computation in New York and the conversations I had with visitors were deeply moving.

What do you think you'll do next with it?

The full installation included a MIDI controller with sliders that added a nice layer of physical connection but I'd like come up with more intuitive ways to bring that physicality to the touchscreen and keyboard. ■



★ HOW TO

DEAL WITH A CLIENT WITH POOR VISUAL TASTE

We asked the @netmag followers how they manage a client who wants to fill their site with horrendous graphics and terrible colour schemes.

FOCUS ON GOALS

"I shift the conversation from their personal tastes to the aesthetic preferences of their target audience. I also emphasise the project's goals so the client understands this is not about them but more about increased sales and brand presence," says @LuckychairNews.

WALK THEM THROUGH GOOD SITES

"Design is about perspective – if a client has poor taste, it's usually because they're uneducated about good design. It's our job to educate them. Looking at successful websites and apps to walk through why they're successful can often help as the proof of the pudding is in the eating," says @McKay_1988

BUILD MUTUAL TRUST

"Usually we try to remind the client we are the professionals with tons of experience although their feedback and insight is highly needed," says @Obergine.

LEAVE WITHOUT A TRACE

If all else fails, @sotaroraiste has this strategy: "Best way to deal with such a client is ensuring you leave no trail that will link that work to you."



BACK-SEAT DEVELOPER

Exclusively for net: The latest in a series of anonymous accounts of nightmare clients

★ CLIENTS FROM HELL



I work as a software developer for a small dev-shop. We make applications for companies and people without the infrastructure to do so. We recently got a new client who also happens to be a developer. I figured that would make things a lot easier.

Client: I want to work with X templating framework, so that you don't have to waste a lot of time on styling.

Me: Okay, not a problem, but this framework is not optimised for the application framework you also want to use and it costs a lot of money. I think I can replicate what you want from this framework myself, at no cost.

Client: No, I'll pay for it and we'll just use whatever we can from it.

Me: Okay. Whatever you prefer.

A week of work later:

Client: Actually, this framework is not optimised

for the application framework I also want to use.
Me: ...

Client: So... maybe we should just try to replicate the small things that we want to use from this ourselves.

Me: (screaming internally)

It's been a month of this project and every decision I've made so far has been countered by him in order to continue with his original idea, only to repeat the exact same thing I told him some time – and work – later, as if this was his own discovery.

Apparently, a side effect of working with people in the same profession as you, is they think they know everything better. Who knew?

CLIENTS FROM HELL
clientsfromhell.net

WOODWORKING

Darrell Estabrook explains how an analogue skill like woodworking can help you fashion a digital career

* BEYOND PIXELS

> It was love at first smell. The freshly cut pine wafted to my six-year-old nose. I made a simple wooden trivet: two stout blocks connected by four spindly dowels. I cut, drilled, glued and painted. I loved it.

It was the full-body experience that got me – the smell of pine and the odour of drilling, the heft of the wood in my hand. But I also loved the process: I fashioned the parts I needed, built the piece and gave it a presentable finish. My mum used this simple, awkward trivet for almost everything that came out of her oven.

These days, I lead a team of designers creating digital products. I can't say whether my woodworking has influenced my design career but the creative process underlays them both.

Consider my latest project: a chicken coop. You can buy a simple structure at your local farming store but those didn't meet my requirements. My chicken coop was to be the focal point of my garden, use non-chemically treated materials and prevent digging predators, flying predators and slithering predators from stealing eggs.

Our digital product clients have their own requirements too. Their acceptance criteria are always defined to meet several goals. The best design is one that meets those goals in a cohesive

and elegant manner. So my beautiful coop includes a cement floor, rot-resistant cedar and an enclosed 'yard' that extends below ground.

I've also learned that while adhering to precise measurements might satisfy the intellect, it doesn't always satisfy my senses. I've stopped cutting materials according to plan specs and started measuring the actual space instead. Now doors and trim fit perfectly even if the numbers on the rule are uneven.

For digital projects, I used to only accept pixel perfection. Elements were aligned in multiples of ten but now fractional pixel dimensions contribute to a balanced and focused layout.

But the greatest satisfaction is challenging myself to explore new techniques. When I wanted to install cedar shingles, I had to research, study and experiment. I face a similar learning curve when I take on a new digital program. Sure, I won't become an expert in a day but if I don't try how will I ever master it? ■

* PROFILE



Darrell (@DesignResponds) leads a talented team of experience designers at SingleStone.



STUFF I LIKE



LIAM FITZGERALD

Multi-disciplinary designer at Frequency Design
<https://www.frequency.ie>

CODEKIT

CodeKit is like a Swiss Army Knife for Mac that compiles and processes a huge list of languages including Sass, Less, JS and Haml. It also optimises images to squeeze every last byte out of JPEG, SVG and PNG files. And the changelogs are very funny!

<https://codekitapp.com>

TOWER GIT

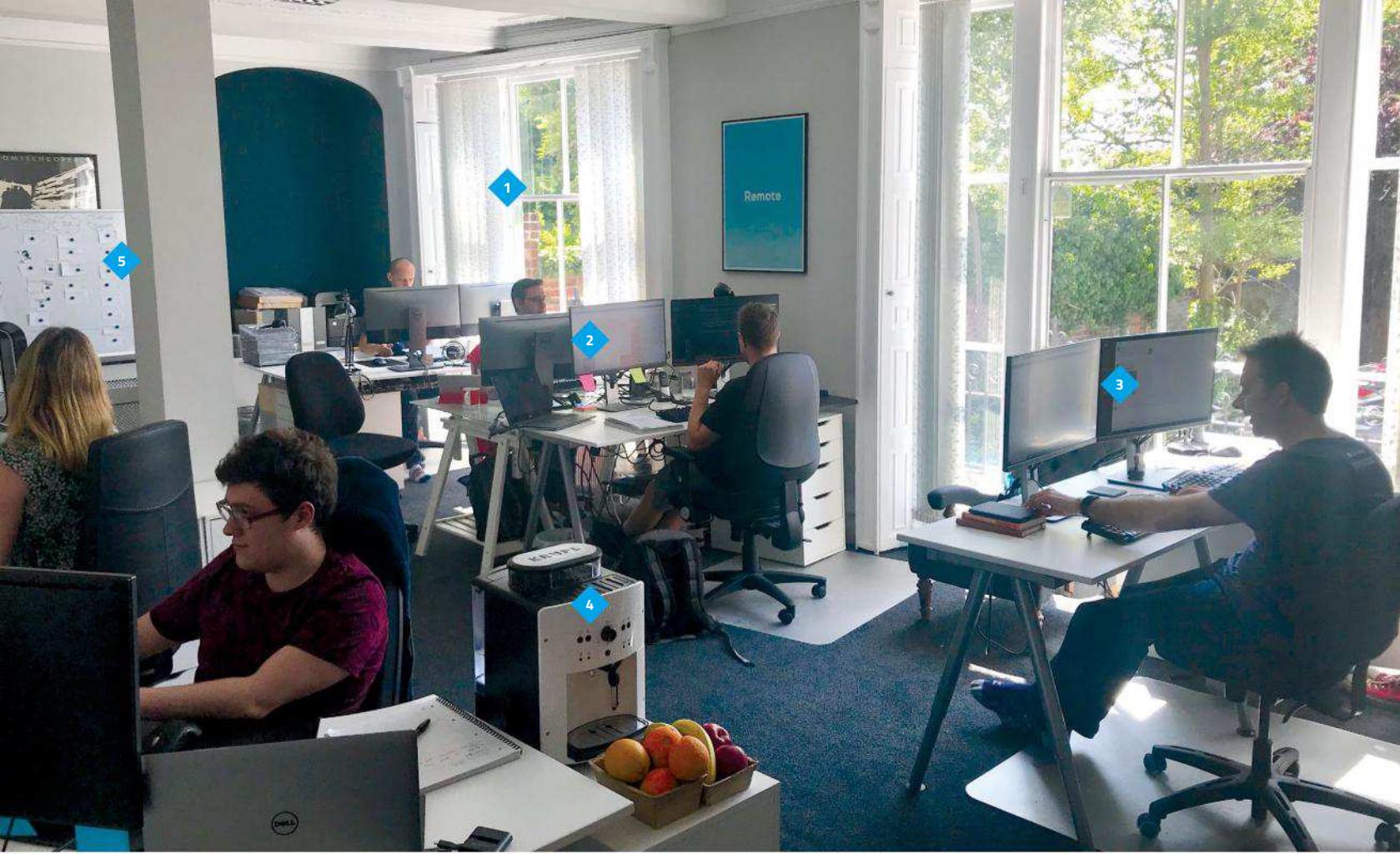
Let's face it: the command line is not pretty. Tower provides the best visual interpretation of repository management, particularly when commits and revisions become complex, making it less of a chore and almost fun!

<https://git-tower.com/mac/>

CODA BY PANIC SOFTWARE

Most developers' editor of choice is Sublime Text but for me it's always been Coda. A comfortable UI is hugely important when you're staring at something for hours every day. Coda both looks and does the business.

<https://www.panic.com/coda/>



REMOTE

Liz Morrison reveals how communication apps and high-calibre caffeine give the agency an edge

* WORKSPACE

Hidden down the cobbled streets of one of England's finest medieval towns, behind the facade of a grand Georgian town house, lies a highly organised, dynamic, collaborative hive of purpose-driven software development activity.

In the shadows of the tower of the ancient town walls, where ghosts from the Norman Conquest might hide in fictional fog as echoes of horse and carriages rattled past, the modernity of Remote is all the more stark. It's as close as we can make it to a programmer's paradise. The latest technology is expected to work hard to create bespoke online software and mobile apps, aimed at helping remarkable teams achieve meaningful work that has a positive impact in the world.

A sense of purpose fuels and guides our company culture and the work we create. (1) We collaborate to solve problems in a conscious and connected way and develop in the shade of the closed blinds on the stunning floor-to-ceiling Georgian windows.

We've put a lot of thought into our management style, the way we organise our days, the vision for the company and each member of the team's personal vision, as well the way we build our software and manage our projects and our workspace, to ensure a truly positive and supportive working environment for the entire team. There is a real and tangible sense of calm efficiency.

(2) The Remote team are connected by Slack to keep our

communication flowing cleanly and to retain vital information.

(3) We practice continuous integration and deployment for short, fast releases and user feedback, utilising Visual Studio Team Services for project management. VSTS also manages our Git repositories in addition to facilitating our 'post agile' management processes.

(4) A sleek and modern coffee machine and organic fruit deliveries on a Monday help to fuel connection and creativity. Quality coffee is a big part of our day. Organic, fair trade, Peruvian Arabica, every time.

(5) As you leave the ballroom that has become the open-plan programmer's suite, there is a large Kanban board covered with a flow of postcards, adding a bit of reliable old-school timelessness to an otherwise cutting edge office.

Written with Paul & Jeannie McGillivray at Remote by Liz Morrison, freelancing writer at Creative Solutions.

* PROFILE

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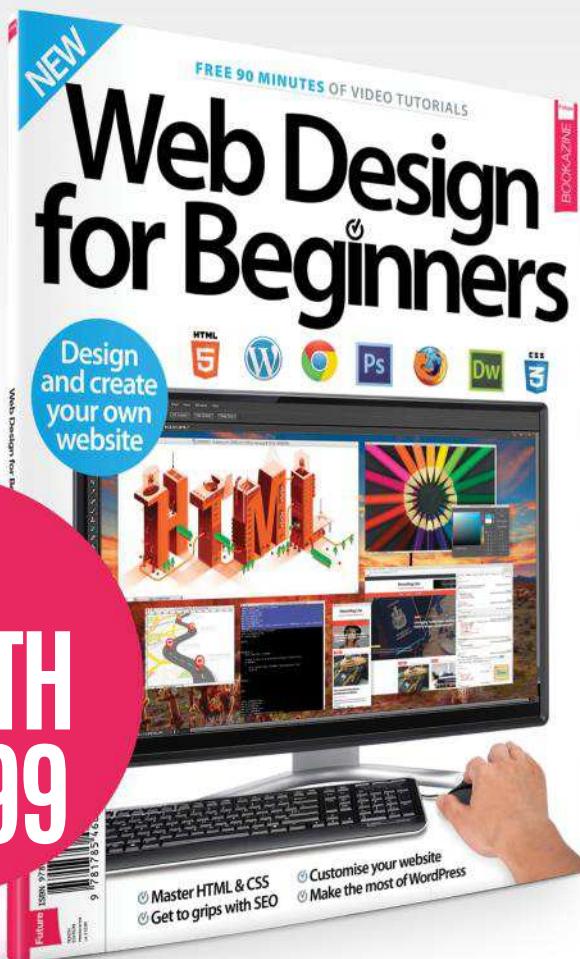
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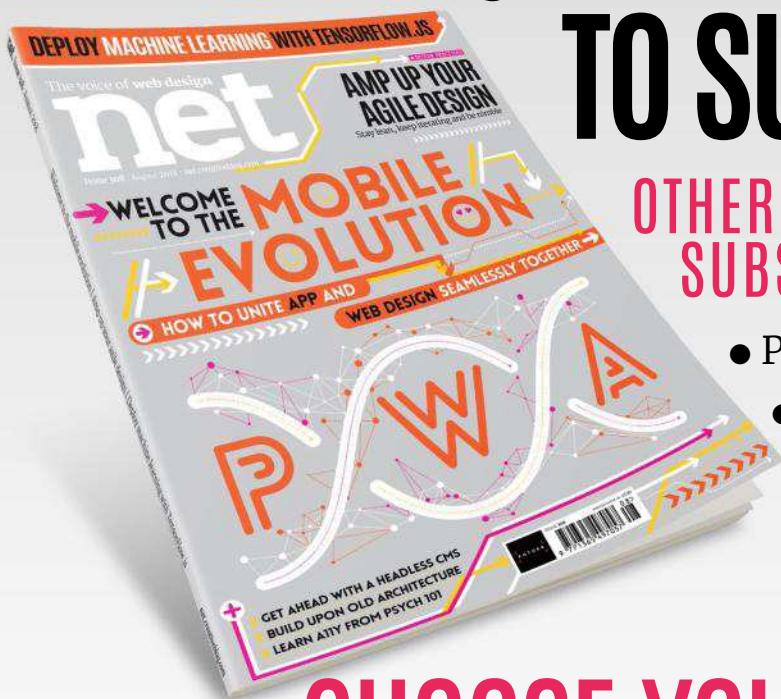
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VOICES

Opinions, thoughts & advice



ESSAY

Andrew Liles discusses releasing value from legacy systems without starting again

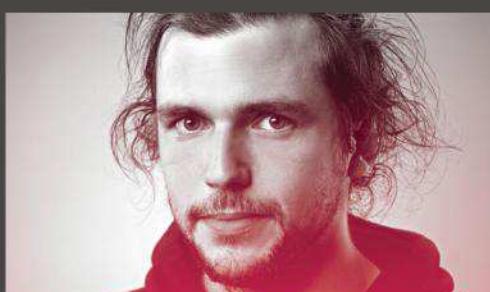
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* UX

SMASH UX FOR SMALL BUSINESSES

Abi Fawcus suggests some alternatives to big budget UX when working for small businesses



I once believed that UX was a catch-all improvement for everything. That was until I started working with small businesses – where brand recognition and volume of traffic is lower, navigation, content and audience segments are simpler and objectives are easier to distil – and it became clear that the balance of return on investment against the cost of UX as a percentage increase in sales was negligible. UX increases performance by increments: where traffic is high this generates considerable revenue on low percentage increases but drop that traffic to less than 5,000 visits a month and the sums just don't add up.

Unfortunately, the catch-22 is that small businesses, a valuable part of our community, need to grow online and so still need to offer a relatively sleek experience to their users. So here are 10 ways to grab the low-hanging fruit in

terms of UX and deliver great results for smaller clients' budgets.

LEARN FROM BIG BUSINESS

Big businesses have spent considerable sums on user experience, so do some research on competitors and large corporations in your client's line of business. Select five to carry out a competitor comparison, getting a good look at dos and don'ts. There's often treasure to be found in their online reviews as well.

Crayon (<https://app.crayon.co/f/>) is a great free tool that showcases businesses by sector or keyword, with previous versions of each website to learn how they have improved over time.

GET UX EXPERIENCE

Employing a designer who has plenty of experience in hands-on UX is a great asset to a small businesses and a key USP in your pitch. There are always ways to practice, study and shadow UX professionals so do your homework.

GOOGLE ANALYTICS

Without talking to a customer, Google Analytics means we can understand demographics' behaviour, location, device, user flow, actions and where they are bailing – if it is halfway through a purchase or action then what's stopping them? Even knowing which blog posts get the most visits helps shape your client's content strategy.

HEATMAPS

If you can't watch a person using a site then heatmaps are a great alternative. Free sites such as Smartlook (www.smartlook.com) allow you to add tracking code providing important information about behaviour. Just remember to list them in the site's cookie policy.

FOCUS GROUPS

Everyone likes a party, especially one where they are listened to! Inviting five customers over with their laptops for a 'lunch hour' with nice food and perhaps a little going-home goodie will give you remarkable discoveries, whilst



Photo: Dominic Whittem

simultaneously creating loyalty and a feel-good factor for your client.

Plan meticulously and be clear in advance what is involved and why. Allocate half an hour to the customers individually fulfilling set tasks on the website, documenting how they are doing and what they feel. Follow this with lunch and a half-hour group discussion.

ASK THE CUSTOMERS

Most businesses have a mailing list so why not ask their customers? Set five simple questions that will open up a discussion rather than just get yes/no answers. Think carefully what will give you most insight into the problems you are trying to solve. Mention all replies are entered into a prize draw, creating good will whilst receiving valuable feedback from real users. To distil findings from your replies use a tool such as Survey Monkey (<http://www.surveymonkey.com>).

INCREASE CONVERSIONS

MVT, CRO, A/B testing are powerful tools in the UX toolbox. But if you don't have

the traffic then the results will be inconclusive. Still, there are gains to be made by learning from the above methods and implementing small changes measured through analytics and heat mapping to increase visitor traction.

FIRST IMPRESSIONS COUNT

If the website doesn't have a lot of traffic or you are in the design phase, UsabilityHub's Five Second Tests (<https://fivesecondtest.com>) are a great little tool to get a snapshot of what people think. Ask a few short questions and get their 'gut' response.

SKETCH!

What pages are needed, what your client's goals are and what customers are looking for can all be brainstormed and sketched out with a pencil and pad to create a very usable site map, page map, actions, content structure and user flow. ■

PROFILE

Abi Fawcett is a UX consultant, visual experience designer and speaker specialising in growing small businesses online.



★ UPDATING SYSTEMS

BUILDING ON TOP OF OLD ARCHITECTURE

Illustration by Kym Winters

Got a legacy system or two? Andrew Liles shows how you can release value from these without starting again

> ‘Oh, that’ll take months to replace.’ ‘We can’t touch that... [in a whisper]... we really don’t know what it does, let alone how it works.’ I’ve lost track of the number of times clients have said these kinds of things to me. But all is not lost. You can innovate with your existing tech solutions; you don’t have to throw everything away and start from scratch.

Imagine this scenario – quite a few years ago, a factory created piecemeal systems to support its internal functions, such as finance, manufacturing, dispatch, marketing and dealing with visitors. As customers’ expectations have grown, its website has not been kept in check. Now more than half of the business’s traffic comes from mobile or small-screen devices but the website does not properly adapt. And the IT solutions are all glued together but still work in silos, similar to the physical teams – making it almost impossible for them to all serve the same customer. This means that five, 10 or 20 years down the road, the business’s IT systems are now inhibiting its growth.

So how do you adapt? Use the same principles you take while refurbishing a building. Think about when you’ve walked into a meeting room that has just undergone an almost overnight refresh. You are startled and pleased by the instant transformation but if you think about it, you know the building itself has all the same structure, heating, water and electricity.

A plasterboard stud partition can hide a whole load of history and messy plumbing, cabling and ducting. Look a bit closer and you will see the same services but modernised with the help of now-universal sockets. The meeting room now has things such as USB power sources, VGA and HDMI ports for displays. However, behind the

scenes, they all feed into the same tangled mess of electrical cables.

We can take this same approach to old IT systems. The goal would be to connect these systems so that we can deliver seamless customer experiences across channels. But what could be some of the challenges working with legacy systems? Let’s take a look at some of the hurdles that might be facing you.

Duplicate customer information: multiple instances of the same individual could exist across different systems such as finance, web, visitor marketing or dispatch. In our fictitious example, there would be six different versions of the same customer across the six different systems.

Depth of data: systems hold information in different ways and to different depths. For example, the operational side of business will often use code numbers for products with the shortest of English descriptions and contain data about things like composition, source of materials and weight. Conversely, marketing material tends to contain copious amounts of text to advertise the features of the product, in addition to including images and consumer pricing.

Different methods of exporting data: in this case you might find some systems will only offer a data export, while others use a 20-year-old standard like SOAP or others use a modern interface like REST.

Interface: some of these systems may have no web interface. Even if they do have one, it may fail to meet accessibility standards or adapt to mobile devices, let alone look consistent from a brand experience.

New channels: there is no way to deliver a service to a new channel such as a Chatbot. ►

- Scale: some systems will be designed to service a small number of users, while others will be designed to be used at internet scale.
- Reliability: depending on how they were built, some of these systems may not be reliable or even available all of the time.

BUILD MODERN FACADES TO LEGACY SYSTEMS

To build a modern web or mobile experience for a business that will better stand the test of time, we look for the front-end to concern itself only in the experience, adapting to the medium the user chooses. The front-end should be flexible enough to be composed of multiple independent functions.

In building refurbishment, we put up new plasterboard and paint the walls, while the superstructure, electricity supply and plumbing behind the scenes stay the same. We can follow the same approach for breathing new life out of your old IT systems: we can put up a new facade that connects to the back-end functions like product data or order management.

“Working with legacy technology is similar to refurbishing an old building. The general idea is not to throw out your legacy IT systems but merely wire them into a new API”

OVERCOME TECHNICAL COMPLEXITY

Despite the seemingly insurmountable barriers to accessing monolithic old systems, there are still ways that enable you to create clean connections between the back-end and the modern front-end. Picture that faceplate that exposes the modern meeting room sockets we require: HDMI, USB, etc – this is what you need to overlay over your ‘legacy’ systems.

We call these APIs (Application Programming Interfaces). The importance of APIs as a concept cannot be overstated. One of the factors in the success of Twitter, for example, is that it launched its platform along with an API and openly encouraged developers to create rival front-ends or apps with the ability to tweet directly from developers’ own products.

Your organisation, like the factory, should be creating APIs like product API, order API and account API. Initially, these APIs would be for internal use (but a bold organisation will make them available to outside parties).

DESIGN API CONTACTS

The design of the API is the most critical phase – your stakeholders need to consider what information would

be needed for all cases and ensure the API is scoped to deliver it (this is called an API contract). This can then be filtered so that a consumer won’t see all of the manufacturing data and instead only receive the information they need.

IMPLEMENT APIs

With the APIs decided upon, it’s then about implementing the API and retrieving the data from the one or more underlying systems. This is often the hardest part of the process but there is a wealth of software ready to assist with this, for example Apigee and IBM DataPower. Some other software options, while still being enterprise-grade, are free to use, such as WSO2’s API Gateway and WSO2 ESB. These tools are capable of translating between SOAP to REST, file-based transfer (exports), handling concurrency, caching results and transforming them. That alone ticks several of the requirements we’ve already covered.

Once the API contracts are approved, you can start building new services – such as an Alexa skill or an order-tracking app – upon them. You’d will no doubt

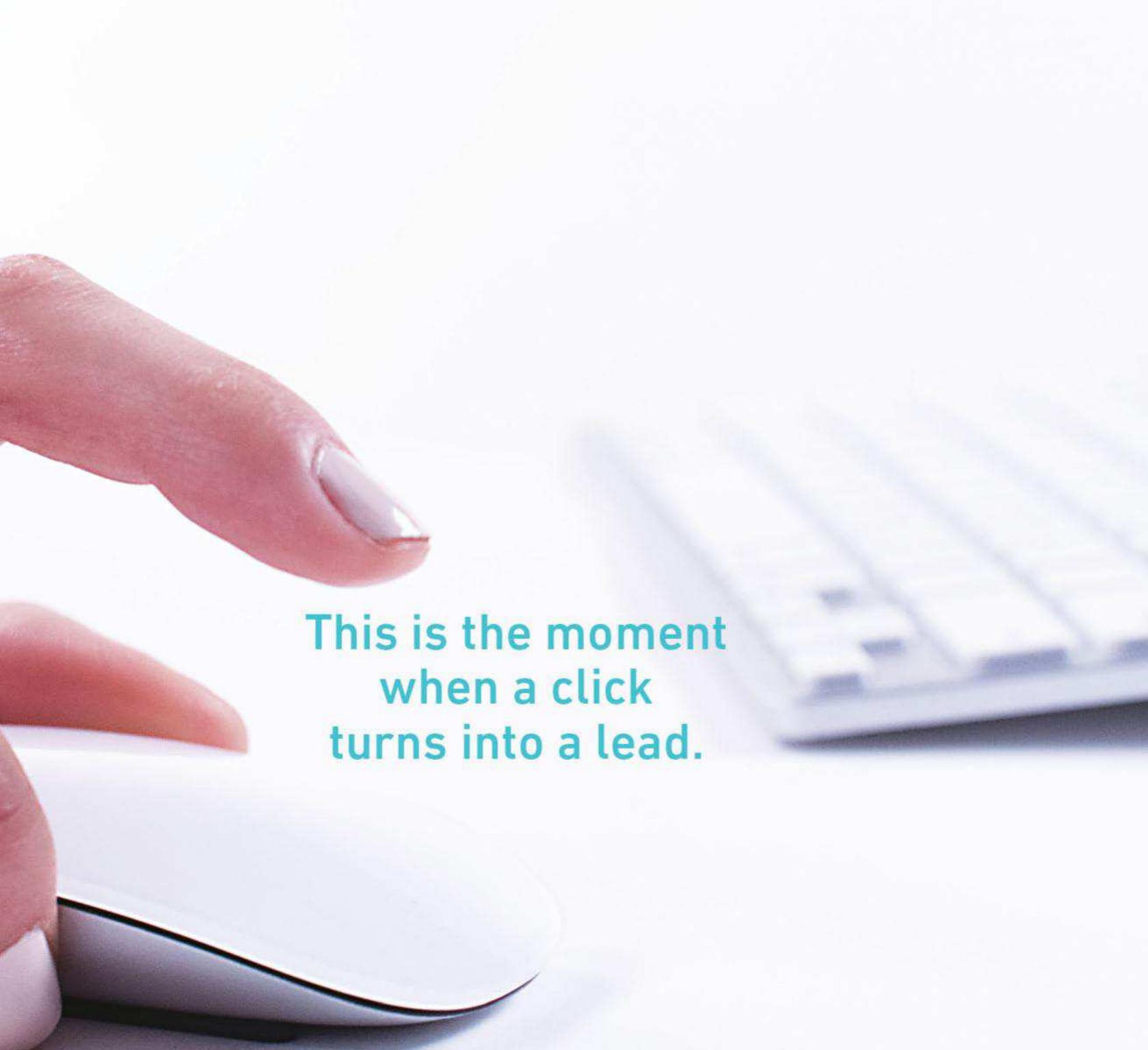
expect multiple consumers to access the same API; a mobile app, Chatbot or website would all need access to the product API, for example. A separate part of the website would give access to authorised users for historic orders via the order API and so on.

If the original back-end doesn’t offer a function to, say, issue a tweet or send a mobile phone notification, then a new function can be added to the API. If you want to add a new website function, app or new channel to market, just set these up as new consumers to your APIs. And you can be sure there will be new consumers: social media applications, Alexa skills or AI Bots. Whatever is next around the corner.

Working with legacy technology is similar to refurbishing an old building. The general idea is not to throw out your legacy IT systems but merely wire them into a new API – transforming data along the way as necessary – to give them new life. ■

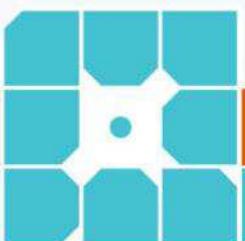


Andrew is the CTO and practice lead of Tribal Worldwide’s Tech Engineering Practice, managing a team that develops, implements, scales and maintains large technical solutions.



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Richard Rutter

Words by Oliver Lindberg

Web typography is experiencing its biggest surge since the arrival of web fonts. We sat down with web-typography evangelist Richard Rutter to talk about his book on the subject, the potential of variable fonts and how good typography induces a good mood



INFO

job: Founder and production director at Clearleft
w: clagnut.com
t: @clagnut

➤ Typography on the web has come a long way. About a decade ago it was still woefully underused and done very poorly. Text wasn't very readable online and the same typefaces were used over and over again. People were throwing their hands in the air, claiming you couldn't do typography on the web well. But there's one man that has been trying to convince people otherwise and that man is Richard Rutter, co-founder of influential UX consultancy Clearleft. Now there's a real surge of excitement about web typography and he's at the centre of it.

One of the biggest game changers right now is the advent of variable fonts, a technology that enables a single font file to behave like multiple fonts. "It's really interesting how quickly this has come out of nowhere," Rutter explains. "Adobe, Microsoft, Apple and Google have all thrown their collective weight behind variable fonts and they all have their slightly different reasons. Google's in particular will be one of performance because you can save an awful lot of space. If you deal with Chinese, Japanese and Korean languages in particular, font files will be a few megabytes in size as opposed

to Latin-based font files, which are much smaller. You can radically cut down the size of these files because you can have a regular and a bold wrapped up together. You've just got one font file for an infinite number of variations. It's also going to be really interesting to see how type designers will provide stylistic variations in their fonts, that are really unusual and that we wouldn't have seen before."

Variable fonts can be used in real projects now. Browser support has reached over 65 percent. Both Safari and Chrome already support variable fonts and Firefox and Edge will follow shortly. The latest versions of Photoshop and Illustrator also support them and they're included in the latest Windows and Mac operating systems as well – Apple's system font San Francisco uses font variations extensively.

Clearleft has used a variable font on the website for Ampersand (<https://2018.ampersandconf.com/>), the web typography conference Rutter is bringing back to Brighton on 29 June after almost three years. It's one of the first commercial sites ever to do such a thing, something that Rutter

explores in his article, How to use Variable Fonts in the Real World: <http://clagnut.com/blog/2390>.

"We set the word 'Ampersand' in six different weights," Rutter enthuses. "Each individual letter is set at a slightly different weight to give it a slightly more hand-drawn feel. There's no way you would have done that in the past! You would have served it up as an SVG but now it's real text, and we can do that with a variable font, which is tiny in size because it's got a very small character set. It's got the full alphabet and very little else but that's all we needed for one word."

Another new groundbreaking tool is CSS Grid, which is revolutionising web layouts. "Typography and layout have always been intrinsically linked," Rutter points out. "The fact that Grid is coming along at the same time as variable fonts technology is very exciting. Grid has been adopted very quickly, and you can use it now. I'm still getting to grips with what it can do because it frees up so much for you in terms of how you can lay out a page and it's inherently responsive as well. It's very, very powerful. There's a bit of a learning curve but anything written by





Rachel Andrew or Jen Simmons will put you on the right track. We've got to really embrace it as designers. It means we can go back and look at all these lovely things that we saw done by brilliant print designers back in the 1960s; while they've always been too hard to do on the web, we can do them now!"

Rutter initially studied chemical engineering and, long before founding Clearleft with Andy Budd and Jeremy Keith in 2005, began his career designing bits of oil rigs. He first discovered his love for typography in the mid-1990s. The web came along and anyone could build a web page if they could type some simple HTML. Rutter found it very rewarding, so he got into design and with that came typography. "In my first proper job as a designer at an agency in London, I was introduced to Robert Bringhurst's book *The Elements of Typographic Style*," Rutter remembers. "It was a revelation. I was fascinated by the way he was typesetting pages and the thought processes behind it. I realised – and fell in love with – the fine detail that he was putting into his work. It really resonated with me. There's a wonderful geekiness to it. There are a lot of

tiny, seemingly meaningless, details that sometimes only you or other typographers can see. It's your own special code in a way but if you get enough of them right, then the whole thing comes together to be something beautiful and enjoyable. They all improve the reading experience."

The discovery of Bringhurst's book prompted Rutter to start writing about typography on the web. He wanted to show people how to apply Bringhurst's guidelines using techniques available in HTML and CSS and became a self-appointed web typography evangelist. Ultimately, it led to Rutter's own book, *Web Typography* (<http://book.webtypography.net/>), a

handbook for designing beautiful and effective responsive typography. Originally it was meant to be co-written by Mark Boulton and fellow typographer Jon Tan, who Rutter co-founded pioneering web font service Fontdeck with (now closed down). It

was also going to be published through Boulton's Five Simple Steps, which shut down when his agency was acquired by Monotype. Despite the setbacks Rutter was committed to the project and decided to go ahead on his own, without a publisher and with the help of Kickstarter; his campaign reached its target in less than 48 hours.

Web Typography is aimed at both designers and developers and blends together

"The fact that Grid is coming along at the same time as variable fonts technology is very exciting"

typographic theory with the practical and technical. Rutter tried to include everything he could possibly think of that would be relevant to web typography. One of the theories he covers is how you can't have a good user experience without good typography.

"Looking at words is the vast majority of what we do on the web," he points out. "Millions of people do it every day and the type is the experience much of the time, which is why it's so important to get right. A few years ago a study done by Microsoft in ►



Photo: Marc Thiele

► collaboration with MIT tried to compare the difference between what was deemed to be good and bad typography. There was no significant difference in terms of the speed of reading, retention of information or even comprehension. The core thing they found was that with good typography the speed of reading felt faster and there was an overall sense of relaxation and enjoyment. With bad typography, people were frowning more, so essentially they found that good typography puts you in a good mood. If that's not the ultimate user experience, I don't know what is!"

Rutter argues that all typography starts with an effort to make sure it's not broken, which includes things like line length, consistent spacing and the text being in an inappropriate size. While the predominant issue in days gone by was text that was on the tiny side, these days Rutter also finds himself pointing fingers at text that is too big – forcing him to sit back in his chair just so he's able to read what's on his screen. "First you need to get the basic typesetting rules right" he advises. "Then the reader needs to intuitively know how important one piece of text is relative to another. They

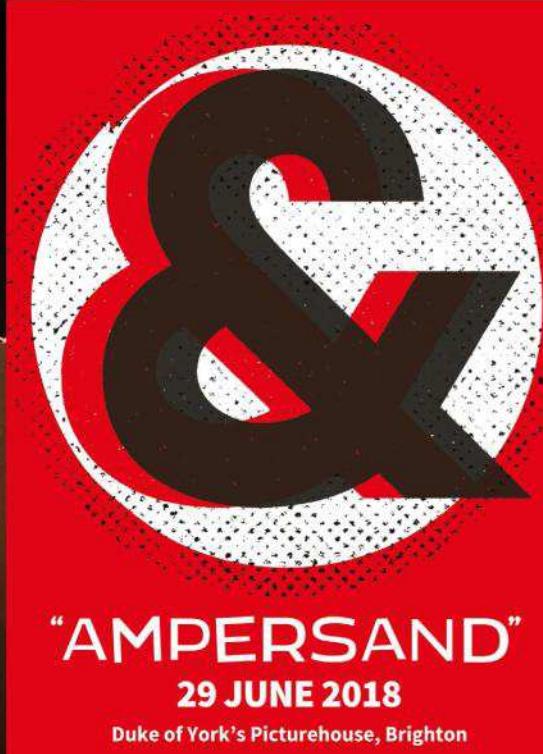
need to be able to scan and find the information they want. The typography needs to be able to draw you in, then get out of your way and not stop you getting into a flow of reading. These are the things that build up to typography being joyful," he says.

Both in his book as well his workshops (dates are coming up at the Ampersand event in June and Generate London in September) Rutter dives deep into responsive design, which he says is what fundamentally separates the web from print but also what brings out its beauty. "In print you have almost complete control over what ends up in front of your reader. The only thing you don't have control over is the light conditions under which someone is reading your text. Other than that everything is fixed and you get to dictate all of it."

"On the web the reader has a huge amount of control. They choose the device, they can bump up the text size, change the size of the window – everything is in their hands. All you can do as a typographer is set guidelines and they need to work under all kinds of circumstances and for all kinds of devices. It's just a mindset you have to get into."

When asked what currently excites him about web typography apart from variable fonts and CSS Grid, Rutter is quick to shine a light on OpenType features and one tool in particular: Wakamai Fondu (<https://wakamaifondu.com/>), built by Roel Nieskens, using Fontkit and Vue.js. Typographers will delight in the tool's ease of use – you can just drop a font on the tool right in the browser and it will tell you about the font's features and even give you all the CSS needed to use them in your web projects. "It's doing everything I'd want it to do," Rutter exclaims. "It shows you these wonderful characters that are being built into a font. It's just a terrific tool."

Typography matters, whether it's in print or on the web. If a text has anything significant to say, then it needs the typographer's care to make sure that what's being written comes across well, which will in turn be repaid by the reader's attention. Finally, we have the tools to do a text justice on the web and make the reading experience as good as possible. But now we can also be really creative with typography and focus on the impact it can have, no matter what kind of device the reader uses. ■





“They found that good typography puts you in a good mood. If that’s not the ultimate user experience, I don’t know what is!”

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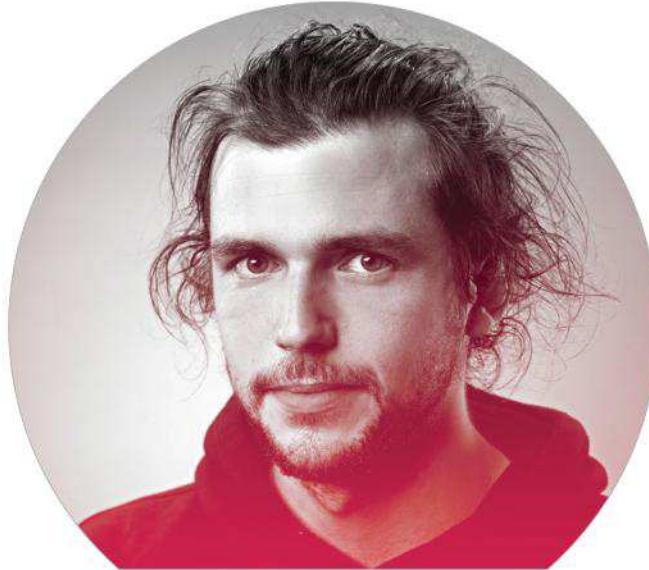
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* Q&A

MARPI

The interactive artist explains what goes into his popular digital installations and previews his forthcoming talk at Generate London



INFO

job: Interactive artist
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t: @marpi_

How did you become an interactive digital artist and what do you like about this work?

It has been a really long journey through a variety of media, roles and countries. And what I've finally found with interactive art, installations and the whole event space is that it's about forging a direct connection with people. It's about seeing people interacting with something I made, their reactions, the way they discover it or how they find ways to use it to create something themselves. I like that art finally not only cares about the viewers but it responds to user testing.

Who are your typical clients?

I don't have clients any more, not in the typical sense. That's been the biggest shift and what's really set me free. Nowadays, I create everything myself. I don't get paid for it but I own it. That means I can exhibit, travel, keep changing and evolving forever and also that everything I do gets better over time. Since there's virtually no barrier to entry for any of those experiences, I can show them at festivals, art galleries, museums, music shows, raves... anywhere really.

What do you find are the biggest challenges of this kind of work?

There are multiple challenges, at both a technical and personal level. Obviously, most of my work relies heavily on expensive hardware: projectors, LED screens, touchscreens. The good thing is that all of it generally is provided by the venues and, as this type of art evolves, a whole new type of space is going to appear everywhere. Through this evolution, artists like me will easily be able to tour, either in person or just digitally.

At a more human level, there's a lot of empathy involved in the whole process. You're building a new virtual language. You're creating an environment that must be easy for people to understand and adapt to but which will also be interesting and varied enough to encourage them to stay. I spend endless hours watching people playing, getting confused, discovering and walking away changed. And the more I learn about what people actually want to do, where they actually want to be, the more my work changes.

Why did you describe 2017 as a "crazy year"?

Last year I did a show, on average, once every two weeks. And things haven't calmed down in 2018 either: this year it looks like I'm going to be doing even more. The good thing, though, is that because of the digital nature of my work, I can run multiple events simultaneously. They also run on the same interaction systems, which means people in different locations can see each other. So instead of trying to limit my work with editions or custom prints, I'm able to use the benefits of web to make all of it infinitely scalable and adaptable to any hardware.

What digital technologies are exciting you most right now?

All of them. It's like a wonderful buffet I wouldn't have dreamed of as a kid. There's so much awesome software and hardware that I already know I won't be able to try everything. That's a great problem to have.

What can web designers expect to learn from your talk at Generate London?

I'll be sharing the story of how, especially nowadays, anyone from any background can become a fully independent digital artist, become visible globally and actually make a change in the direction the future is going. All the software is free, all the hardware can be shared. There are no real borders left: all the tools are already out there. And no one knows where any of those journeys end. ■

Marpi will be giving a talk at Generate London, 19–21 September 2018. For more info, visit generateconf.com.

* WORK DECISIONS

WHAT DEAL-BREAKER WOULD STOP YOU TAKING A JOB?

You know it's a mistake to accept everything that you're offered – but when should you say no? Seven designers explain where they draw the line



KRISZTINA
TOTH

Full stack web machinista
krisztinatoth.com

 When a potential client contacts me, the tone of their first message is often decisive. Going beyond basic politeness, I look for people committed to their goals, with a clear vision of what they want to accomplish. I instantly reject the 'I could do it myself but don't have the time' type. As for the project itself, I only take assignments that advance my skills. I draw the line at copy-paste sites and 'coming soon' pages because even though they're easy money, they offer no professional or personal development.



RANJIT
SIHAT

Graphic designer
inmotiondesigns.co.uk

 Being asked to use images where the copyright is held by someone else is a deal-breaker for any contract. The relationship between client and designer should be based on trust, creating a unique design and selling the identity of the individual business, not someone else's. Mostly these issues are easily resolved but there are occasions where a client refuses to listen and asks for an image to be used, regardless of ownership. This is where we say thank you and goodbye.



ANNA
NEGRINI

Web and
graphic designer
pannacida.biz

 At the start of my freelance career, I accepted all the work I was offered. Only when I heard great designers talking about the right to say 'no' did I realise I was wrong to do so. Now, situations that are deal-breakers for me include when the proposal has the words 'superstar' or 'ninja' in it (you probably won't get paid); if the client estimates the time you're going to spend on the project; or when the expectations are entirely unrealistic (£1,500 for a website like Gucci's... really?). Sometimes, though, it's just a gut feeling: I start sweating and I feel 'trapped'. In these circumstances, I've learned to trust my instincts and just say no.

**JOHN TAYLOR**

Freelance digital designer
johnayloronline.co.uk

Location is my biggest deal-breaker. Most of my freelance and contract work is in-house, so the practicalities of daily travel – distance, time and cost – are important before I've even met the client, discussed a project or seen a brief. Travel time and costs aren't usually billable, so I need to ensure the job's financially viable before agreeing. Travelling can also be tiring and stressful, so to ensure I maintain a good work-life balance I factor in what time I'll have to get up in the morning and get home in the evening.

**CLIFF NOWICKI**

Designer
cliffnowicki.com

Pay is at the top of the list. If I've learned anything in life, it's to not undervalue yourself. The low-paying jobs and freelance gigs I took on earlier in my career were the biggest soul-sucking times of my life. However great a position seems in terms of environment and benefits, I can't accept it if it's paying half the market value. Yes, some people starting out have family or loved ones who can shoulder the financial responsibilities, allowing them to take on underpaid, first-time jobs: more power to them. But for me, low pay is a huge red flag.

**SHELBY SAPUSEK**

Owner, designer and wordsmith,
Whatness Websites & Words
twitter.com/shelmke

Refusal to sign a contract outlining expectations, estimated timeline and cost of project is a real deal-breaker. When you don't have that, the project often stalls and doesn't get completed in a timely fashion – and as a business owner, that can get costly. If I've created the nuts and bolts of a site for the client through my hosting service, I'm paying for that development site whether it's live or not. I've experienced project stalls that have lasted for months. That's a lot of extra cost if you don't have an agreement beforehand. So a signed contract that lists goals and timelines is a must-have for us.

**STEPHEN DAWE**

Creative director and owner, DA
Branding Inc
DABrandinginc.com

Having a conversation – with the possibility of it turning into a new client relationship – can be one of the most exciting parts of the job. However, there can be deal-breakers that prevent me moving forward. One is a client assuming design is simply the ability to use the software. It's our role as industry professionals to educate new clients on exactly what it is we do. Design is about problem solving, not just aesthetics. Moving forward comes down to whether they're open to learning that or not.

RESOURCES

10 GOOD REASONS FOR TURNING DOWN WORK

<https://netm.ag/2IHgLOM>

+ When you're starting out as a freelancer, it's tempting to say yes to any work that comes your way. You'll soon discover, though, that it pays to discriminate. In this article, Bryce Bladon outlines when it's best to say no.

WHY FREELANCERS SHOULD TURN DOWN MORE WORK

<https://netm.ag/2L1z8MY>

+ Saying 'no' to work isn't just about turning down badly paid work or projects that seem laden with problems. As David Mahoney explains in this post, it's about finding work you're passionate about.

6 STEPS FOR DEALING WITH CHEAPSKEATE CLIENTS

<https://netm.ag/2rHN1aQ>

+ Over 70 percent of freelancers say a client has stiffed them on paying an invoice. The best way to avoid these cheapskates is to use a solid contract. But, if preventative measures have failed, here are six steps for getting paid.



★ THE DESIGN OF BUSINESS

DISTRACTIONS

Christopher Murphy explains how to minimise distractions to focus on getting things done



job: Writer, designer and educator

w: tinybooks.org

t: @fehler

> One of the biggest challenges in business – especially when you're running a company on top of another job – is finding time to get everything done. Following through on strategic goals requires time and time can often seem in short supply.

Managing distractions is critical if you're to get everything done that you need to. Unfortunately we live in a world filled with interruptions. Smartphones might be very empowering but they can also be incredibly distracting.

One of the unfortunate by-products of having a computer in your pocket or on your wrist is it can feel as if your mind is being pulled in a thousand directions at once. While useful, notifications, if they're not controlled, interrupt your flow.

Getting into a 'flow state' where you become so absorbed in a task that time seems to evaporate, improves your productivity hugely. The secret to maintaining this state is to put a stop to interruptions so that you can keep the flow going. Carving out time for flow helps hugely.

Identifying potential interruptions and then establishing strategies for managing them improves your productivity. Developing a strategy for notifications is a great place to start, helping to compartmentalise them.

You can begin to build a barrier around your productivity by managing alerts, wherever they occur. A good place to start is switching off vibrations, silencing audible alerts and removing those ever-present little red badges that annoy you with their 'something's urgent' calls to action.

TIMEBOXING

With your notifications tamed, it's time to turn your attention to email, messaging applications and social tools, all of which are equally capable of derailing you. Of course, these communication tools are the glue that keeps everything flowing but that doesn't mean you shouldn't compartmentalise their usage.

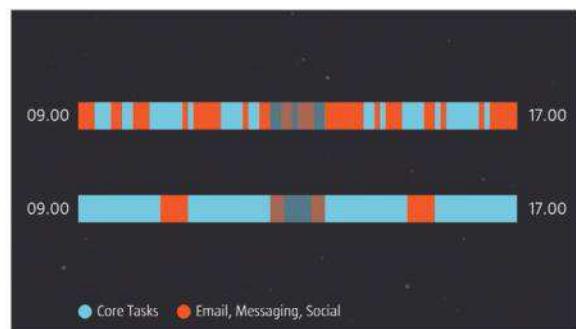
If at all possible, try not to start the day with email. Dealing with email first thing in the morning has the potential to derail your day, destroying your productivity. Checking email – even if you don't reply right away – can play on your mind, overtaking your subconscious, rendering it very difficult to get anything worthwhile done.

Setting aside 'do not disturb' time for email – not just for evenings but during the day too – can help you focus on core goals without your mind being interrupted. Checking email mid-morning and mid-afternoon gives you uninterrupted 'timeboxes' that you can use to get things done.

Timeboxing is a time management strategy that compartmentalises activities, ensuring you make the most of the time you have available and maximising your chances of achieving flow. By timeboxing activities you can manage time more effectively and maximise your productivity.

By setting aside timeboxes for critical tasks at the start of the day, you give yourself the mental space to focus on important goals, before distractions creep in. If you can hit a milestone early on, so much the better: this will give you a welcome morale boost.

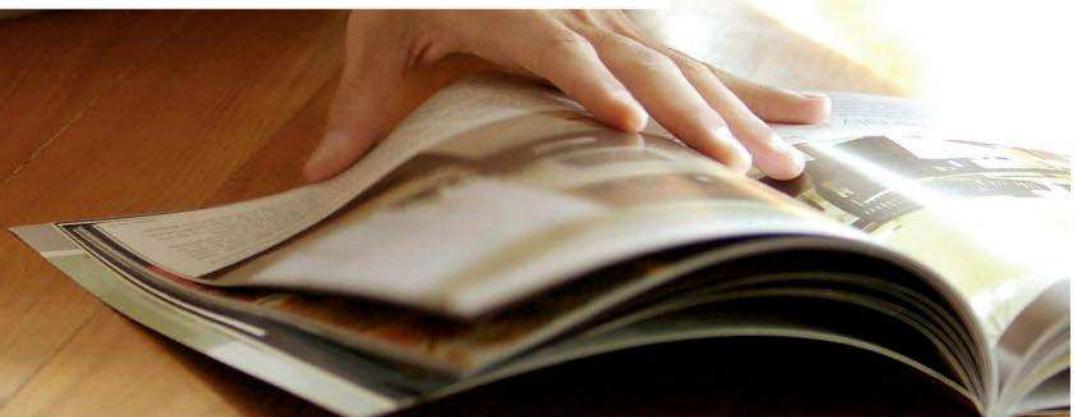
Embracing a timeboxing strategy can help you build a schedule that defragments your day, giving you space to focus. The key is to work smart, manage distractions and make every moment count. ■



By compartmentalising distraction-prone activities, you free up your time for flow-focused, productive work

PUT A PAUSE IN YOUR DAY

With so many demands from work, home and family, there never seem to be enough hours in the day for you. Why not press pause once in a while, curl up with your favourite magazine and put a little oasis of 'you' in your day.



PRESS PAUSE
ENJOY A MAGAZINE MOMENT

To find out more about Press Pause, visit:

pauseyourday.co.uk

NEVER MISS AN ISSUE!



#307 JULY 2018

Soup up your design process and put your dev work into top gear, test your way to success and use Node.js to minimise memory drain

SAVE UP
TO 31%
WITH A DIGITAL
SUBSCRIPTION
SEE PAGE 18



#306 JUN 2018

Solve your programming puzzle with 25 practical JavaScript tools, perfect your prototypes and become a Vue.js virtuoso



#301 JAN 2018

Next-gen UX. Revealed: how to design for the invisible interface revolution, plus master the science of Conversation Rate Optimisation

GOT AN APPLE DEVICE?

Download net's digital edition for your iPad, iPhone or iPod touch

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#305 MAY 2018

Learn how augmented reality has changed the web-design landscape. Become a data-viz whizz, prettify pop-ups and perfect parallax FX



#304 APR 2018

Explore the world of CSS animation with Animista.net's creators. Code custom WebGL effects, prototype with Origami and get top PWA tips



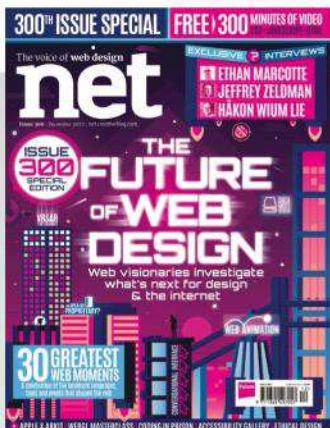
#303 MAR 2018

A pro guide to all the best tools in web and UI design, 10 expert React.js tips, the 5 best code editors and Blockchain explained



#302 FEB 2018

50 amazing dev tools for 2018, plus prototyping at Netflix and a free, bumper 20-page design trends supplement



#300 DEC 2017

Web visionaries investigate what's next for design and the internet in our special 300th edition, plus 30 greatest web moments



#299 NOV 2017

Build the perfect career in web design with our career special. Land your dream job, expand your skill set and become indispensable



#298 OCT 2017

Rachel Andrew guides us through the features of CSS Grid Layout we're not making the most of in a bumper CSS Grid Secrets special



#297 SEPT 2017

Our first-ever accessibility cover looks at how we can design a better web for all, delving into inclusive design principles

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GALLERY

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LEON BROWN



Developer and author of e-learning content at nextpoint.co.uk. Leon makes complicated concepts easy to understand and fun to learn.

t: @_LeonBrown

V Village
Software Engineers

- ABOUT US ▾
- SERVICES ▾
- SECTORS ▾
- CASE STUDIES
- BLOG
- CONTACT US
- SUPPORT

SITE OF THE MONTH

Remarkable software

We engineer software solutions to improve business performance.

How We Work

* BOOTSTRAP, CSS, HTML5

VILLAGE SOFTWARE

<https://villagesoftware.co.uk>

The new website for Village Software uses a clean and modern-looking theme that manages to present software engineering as a relatable concept to non-developers. With its purpose being to market the company's services to other businesses, the website is tasked with promoting the benefits of using bespoke software systems, via a format that's easy to understand even for people who don't possess a technical background.

Managing director Jonathan Read describes the website as a platform for sharing knowledge and expertise, an exercise that leads to awareness and confidence of the business within its target sectors.

V Village
Software Engineers

- ABOUT
- SERVICES
- SECTORS
- CASE STUDIES
- BLOG
- CONTACT US
- SUPPORT

Case Studies

Rebuilding at scale with ZyroFisher

[Read More](#)

Industrial Real Time Reporting

[Read More](#)

Highways Safety System Monitoring

[Read More](#)

This focus on presenting the business as a reliable and easy-to-work-with partner is reflected in the design and theme of the site. Its presentation is more than just pretty colours and pictures. Effective use of UX design has been applied for easy navigation, with clearly identifiable visual cues and spacing to separate content segments. Written content is also crafted to keep reading at a minimum, without unnecessary jargon.

The combination of design and copywriting has led to a website that's clear to read and easily navigated. There's no small print here, just easy to understand content.

STEAM
SCIENCE | TECHNOLOGY | ENTREPRENEURSHIP | ART | MATHS

Are you prepared for future jobs in tech and digital?

EDUCATORS **PARENTS**

* WORDPRESS, HTML5, CSS

STEAM SCHOOL

<https://steam-school.com>

> The recently launched STEAM School is an online content subscription service to inspire young people into taking an interest in STEAM careers. For those not acquainted, STEAM is the new version of the old STEM curriculum for science, technology, engineering and maths. Arts has now been added to the mix.

In an age where maths and computing are considered boring and complicated subjects, STEAM School's challenge is to present itself as relevant and interesting to its audiences. The website's use of colourful design and sectioned content navigation present the service's purpose in ways relevant to young people, while being easy to understand for parents and teachers.

Head of STEAM School, Jade Parkinson-Hill, mentions how the website was created to promote the teaching benefits of the service. With the current teacher workload crisis, the service enables teachers to deliver premium learning experiences without committing to overwhelming lesson preparation.

Instead of focusing content around endless text descriptions, the website makes good use of gallery and video elements in order to demonstrate the subscription service.

STEAM
Would you like a weekly dose of tech inspiration and aspiration?
Steam School hosts a weekly live broadcast & mini challenges with innovators from the world of science, tech & digital media for schools, colleges and digital families.

Robots, automation and digital technologies are transforming the world that we live in. For many people work has become something that we carry around on a mobile device or laptop instead of something of a place that we travel to everyday. Innovation is rapid. Who can predict what those careers will look at in 10 or even 20 years time?

Louise Leolin, Edited Q&A
Louise Leolin
DINORYTE LABS

Video Games Design



Sea

What's On

Get Involved

News & Articles

Events & Video Production

About us

Visit

Light Night 2018

We'll be hosting pop-up gaming showcases and tournaments from games studios, artists and students from across the city and beyond, turning FACT into an immersive gaming hub.



★ JQUERY, HTML5, CSS

FACT

<https://www факт.co.uk>

 A Liverpool-based media arts centre, FACT uses its website primarily to attract people to its upcoming exhibitions, events and theatre showings. Its events cover both traditional and technology-led art, with many programmes such as the Freehand project providing young people with exposure to learn digital creative skills.

The website plays an important role in the organisation's community engagement strategy. From enabling people to check the schedule for films on show at the theatre, through to providing information about current education programmes, in addition to booking the centre's facilities for hosting events.

If you've ever been in the position of planning a day out, you'll know that it can be a bit hit and miss to find details of places worth visiting when you're unsure of what to look for. FACT's use of a blog-style news section delivers an answer to this problem, providing a resource to inform potential visitors about the dates and times of upcoming events, exhibitions and anything else taking place at the centre. For people who are interested in visiting on a more regular basis, the website offers the ability to register for the newsletter to make sure you don't miss anything of interest.

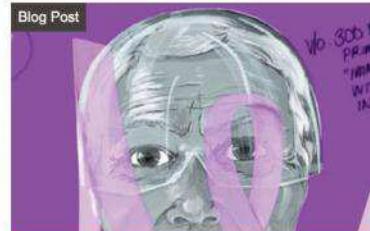


Blog Post



States of Play: A Socio-political Analysis by Shihab Mozumder

Blog Post



Being part of the commissioning process for Worlds Among Us

Support Us

States of Play and 15 Years of FACT: A Political Perspective by Shihab Mozumder

14/05/18

As someone that studies politics, I find that the political value of the tech, creative and cultural sector is rather underrated, and with the 15th Birthday of FACT Liverpool this year, now is a better time than ever to look at what's been achieved.

[Read on >](#)

News

No. 300 years of PRIME TEAM INVENTION WITHOUT INTERVENTION

Announcing a new commission by Anna Bunting-Branch for Wysing Arts Centre, The Mechatronic Library, FACT and QUAD.

★ HTML5, CSS, JAVASCRIPT

CODE ANYWHERE

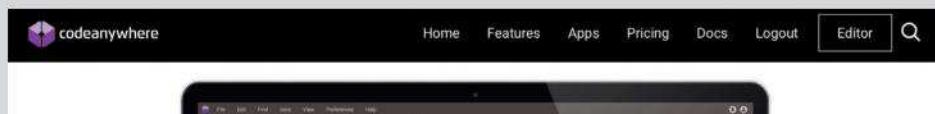
<https://codeanywhere.com>

> A handy tool for web developers, Code Anywhere is an online programming environment that is run from your browser. The advantage of using this tool over an environment installed locally is in the name. Whether you are using a Chromebook, tablet, smartphone or just a humble desktop sat at a public library, Code Anywhere means that you are able to access and develop your project code from, well, anywhere.

People tend to be creatures of habit, hence the website having an important task to convince programmers like yourself to try this new approach to writing code. For this reason, a very

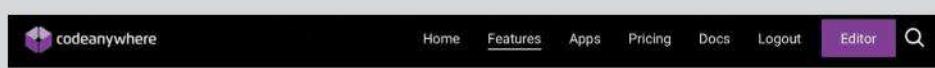
'Apple-esque' design has been applied to present the benefits in a way that even the most stubborn of programmers will be able to see at a glance.

The benefits of Code Anywhere are made immediately clear upon landing on the homepage, with a dedicated banner being used to provide an instant impression of the tool's capabilities. This banner space is used to provide visual examples of the application in action, controlled by tabbed navigation used to present each feature, along with the option to read further. All page content has been designed and written with an ability to quickly communicate the message at a glance.



Editor Remote Connection Terminal console Revisions

With the amazing editor in Edit your code remotely wherever it is Use built-in terminal console to run Revisions allow you to see



Editor Terminal Collaboration Revisions Connections Containers

Python
 HTML5
 JavaScript
 C++
 Java
 Ruby

- 75 Programming languages syntax
- Code completion (js, php, html, css)
- Linting (js, css)
- Multiple cursors
- Zen coding support
- Code beautify
- All device and browser support

The homepage features a blue header with navigation links for 'For families', 'For schools and communities', 'For careers', and 'Members' Login'. Below the header is a banner with the text 'TRUSTED BY PARENTS. LOVED BY KIDS.' and the 'Explore LEARNING' logo. To the right, it says 'Call us on 01483 447414'. The main menu includes 'Find a centre' with a location pin icon, 'Maths & English', '11 Plus exams', 'Why choose us', 'Results', 'Support', 'More', and a prominent red 'TRY FOR FREE' button. Below the menu are links for 'Search schools', 'Exam information', 'Resources', and 'Get started'. A large central image shows a smiling child with the text 'AWARD-WINNING MATHS AND ENGLISH TUITION' overlaid. A yellow badge on the left says '11 PLUS AND ENTRANCE EXAMS'. At the bottom of the main section, there's a message about the 11 Plus course supporting children from Year 4, followed by a 'FIND OUT MORE' button and a 'Leave a message' link.

* WORDPRESS, HTML5, CSS

EXPLORE LEARNING

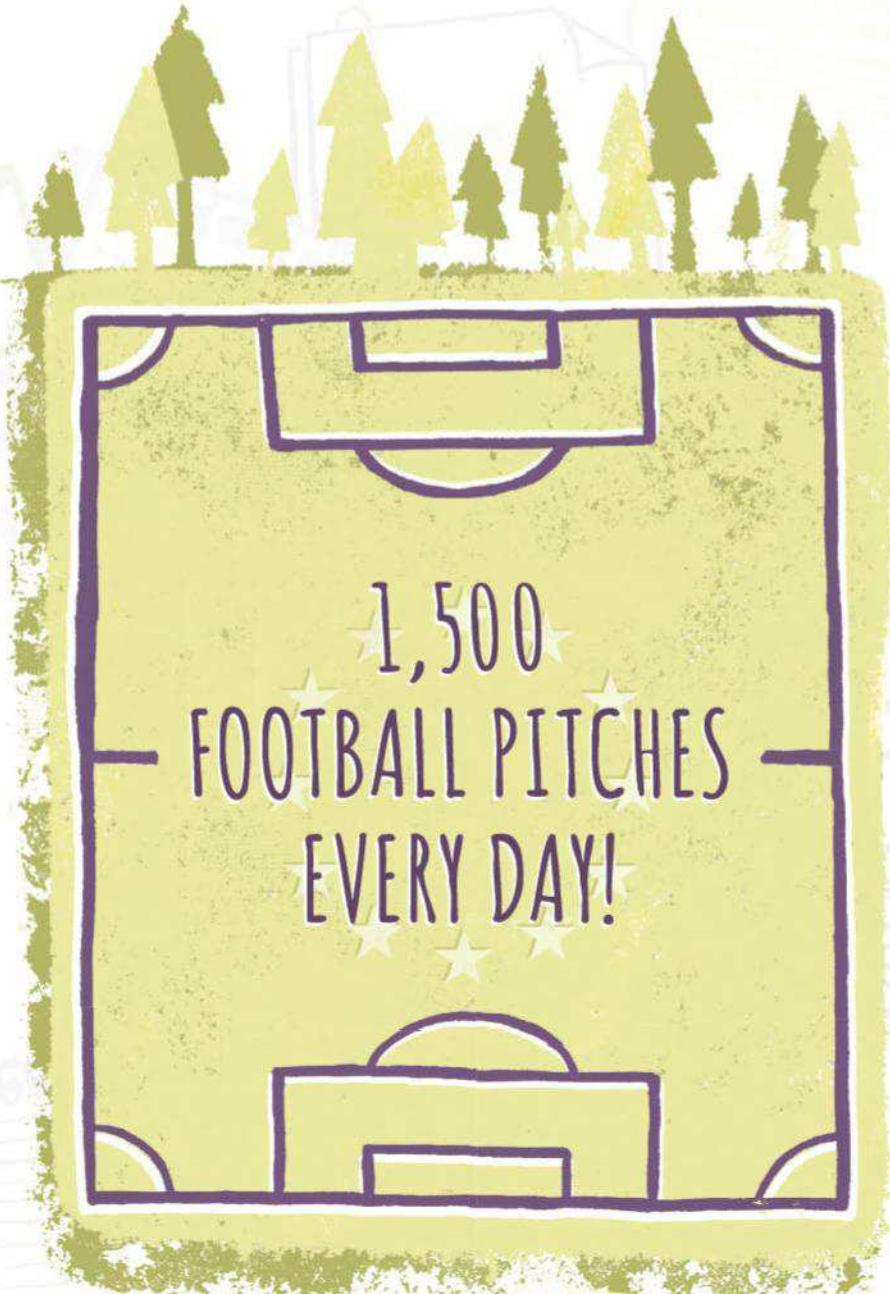
www.explorelearning.co.uk

> Explore Learning is a national tuition agency supporting children between the ages of four and 14 to learn maths and English. The website has a primary role for supporting the business marketing, with many parents being introduced to the website via traditional marketing materials and pay-per-click advertising.

The consistent message promoted throughout the site is based around how the tuition boosts confidence in learning. Interestingly, this theme is repeated in the marketing message – instilling confidence in parents in the company's ability to deliver results. One feature that helps the website to achieve this is the presentation of Trustpilot reviews, displaying an overall 'excellent' rating alongside the most recent reviews.

Beyond generating confidence, it's clear that the ultimate goal is to provide complete information to parents interested in its tuition services. A free sample lesson is prominently promoted throughout the website to incentivise parents to make an enquiry. Supported by an online database, this registration feature makes it extremely easy for parents to locate and register with the nearest tuition centre by simply entering their postcode. Clear planning of UX design for this makes sure that there are minimal reasons for parents to abandon their enquiry. ■

This page shows a trial offer for parents. It features a 'BOOK YOUR FREE TRIAL' button and a message encouraging users to try the service. It displays Trustpilot reviews with an overall 'Excellent' rating. Logos for Ofsted Registration, National Curriculum, Curriculum for Excellence, Northern Ireland Curriculum, and The Tutors' Association are shown. A banner at the bottom reiterates the 11 Plus and Entrance Exam support for children from Year 4. A 'FIND OUT MORE' button and a 'Leave a message' link are also present. The page ends with a section for finding nearest centres.



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Did you know that European forests, which provide wood for making paper and many other products, have grown by 44,000km² over the past 10 years? That's more than 1,500 football pitches every day!†

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†UNFAO, Global Forest Resources Assessment 2005-2015.

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There are some great reasons to #LovePaper
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twosides.info



SHOWCASE

Sublime design & creative advice

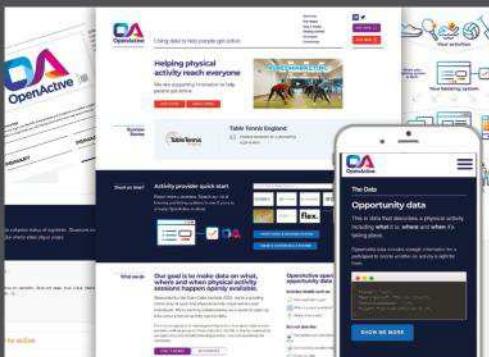
THIS MONTH FEATURING...



PROFILE

50

Danish designer Signe Roswall tells us about the challenges of freelancing, making design enjoyable and inspiring users to just be human



HOW WE BUILT

56

We look behind the scenes of OpenActive, a new initiative that harnesses the power of data to help reduce inactivity in England

DESIGN CHALLENGE

This month...

DESIGN MEETUPS

* PROFILES



NEIL QUINN

Neil is a designer at Polleni, an agency specialising in graphic and web design.

w: www.polleni.com t: @polleni_agency



JAKE HINDS

Jake is creative designer at Bopgun, working on clients like Innocent and The Economist.

w: bopgun.com t: @bopgun



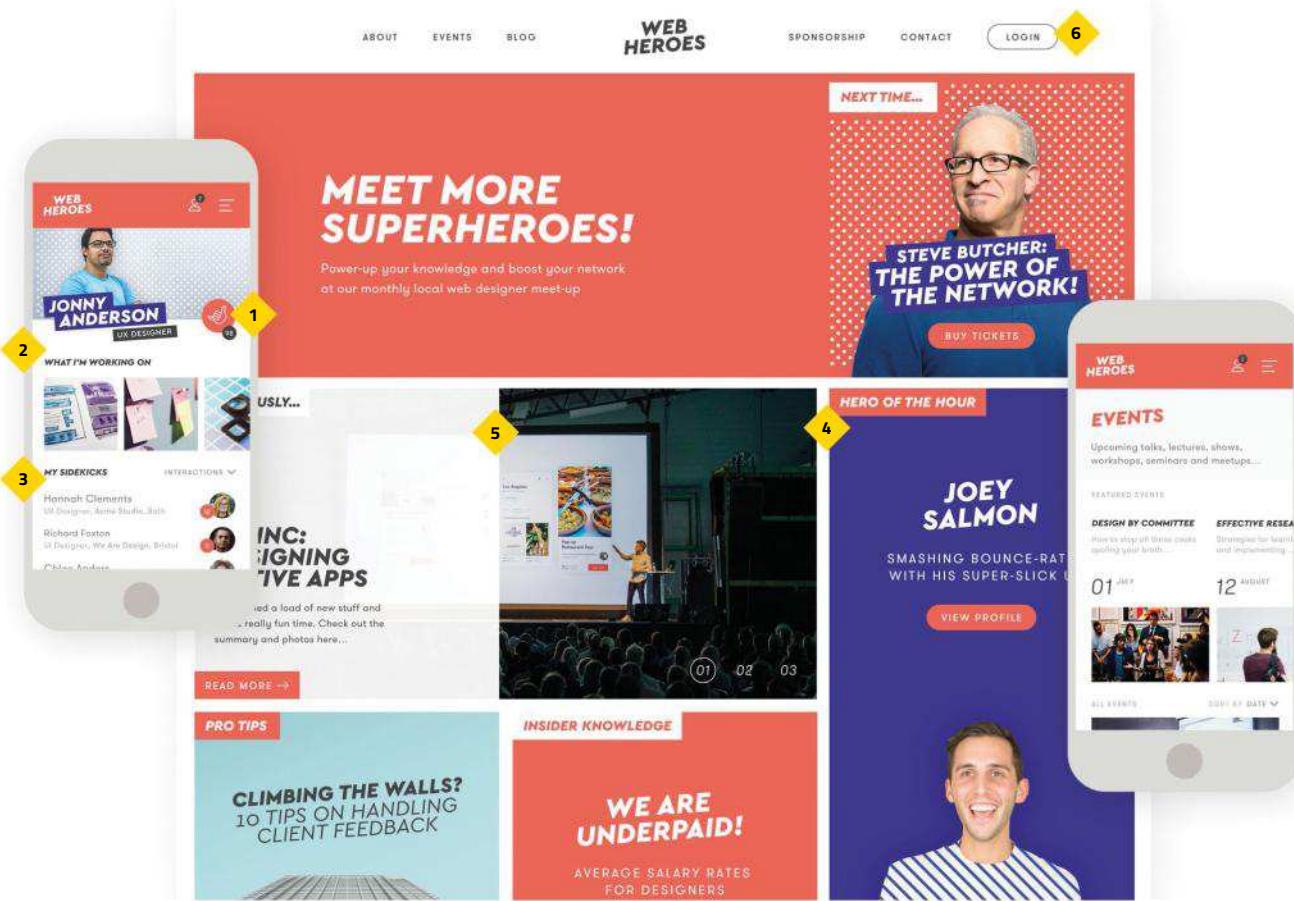
TIM BREEZE

Tim is a freelance graphic designer and front-end developer based in the West Midlands.

w: <https://tim-breeze.com> t: @tim_breeze

BRIEF

This month we would like you to design a website for a regular local web-designer meetup. We would like your site to prioritise all the important information such as dates, times and location, as well as using an impactful visual design that will entice new attendees to join.



★ NEIL QUINN

WEB HEROES

A pop-art-inspired social-networking site that enables attendees to keep in touch

➤ Web Heroes is a website for a local web designer meetup that is as much about the people attending as it is the content of the site itself. It serves to extend the lifetime of the physical meet into the digital domain, where each person (or 'Hero') attending has a place to find out about forthcoming events and forge links and connections with other members before or after a meet has taken place.

Inspired by Lichtenstein and pop art, we developed a playful comic-book style grid, which was used to reinforce the idea that each person was a Hero. Their superpowers are represented – Top Trump style – in their profile information: what they're working on, where they've worked and their interactions with others. Heroes can 'like' or 'hang' with others they've met and see who has hung with each other using a counter. The typography, photography and bold colour scheme is confident, contemporary, a touch irreverent and fun: perfect for a memorable meet.

CLOSE UP

(1) Hang Loose / Call Me Button & Counter: this enables users to 'like' or 'hang' with people they have met and see who has hung or interacted with other people from the event. This is a good way of gauging and planning who you'd like to hang out with at the next meetup too. **(2)** What I'm Working On: this is a scrollable feed of images of work, which is visual, simple and straightforward. **(3)** My Sidekicks: these are the people who you've interacted with the most, as shown by a counter of 'hangs' or 'likes'. There is also functionality that enables you to see which agencies people have worked at. **(4)** Hero of the Hour: this is a feature that profiles a member of the meetup community who is currently doing great things. **(5)** Previously: this is a section that links to images and a summary of previous events on the site **(6)** Login / Account: a profile section used to show everyone you've met, events you've previously attended and ones you intend on going to in the future.

MY MONTH

What have you been working on/doing this month?

A brand identity and signage for a shop in Bristol (Co-LAB) that sells the work of independent designers and illustrators.

Which two websites have you visited for inspiration?

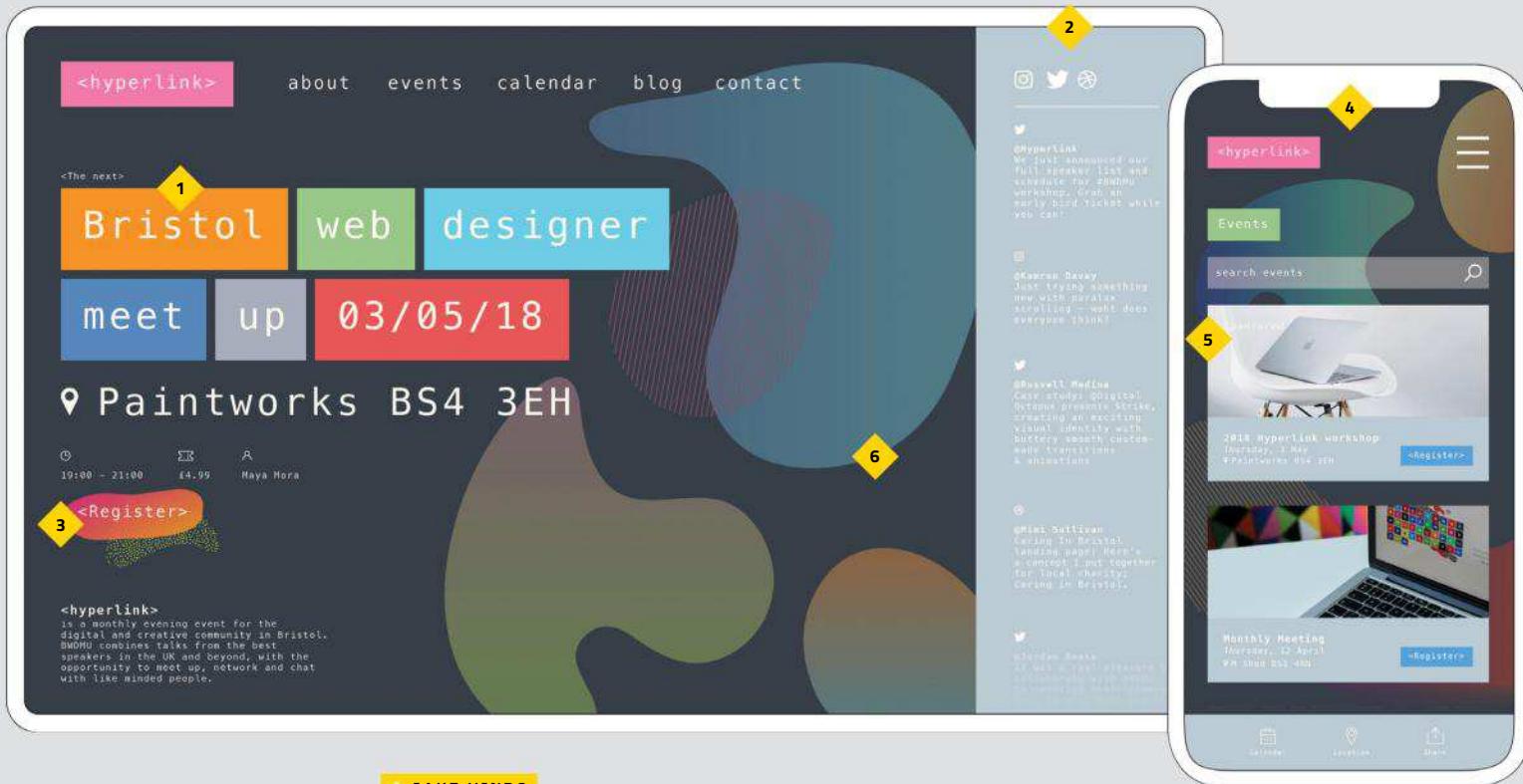
We loved the Pantone 805 work in Bureau Display (www.bureaudisplay.com) and the sites on Httpster (<https://httpster.net/2018/apr/>).

What have you been watching?

An Art Lovers Guide to Lisbon – interesting documentary on BBC4.

What have you been listening to?

Trouser Jazz by Mr Scruff. Old school.



MY MONTH

What have you been working on/doing this month?

I've just moved to Bristol – so a lot of exploring with my camera. And a new job at Bopgun, so loads of new clients to make lovely stuff for.

Which two websites have you visited for inspiration?
designspiration.net for general design and eventbrite.co.uk for the events website.

What have you been watching?
The Defiant Ones, Rick and Morty and Abstract.

What have you been listening to?
Colors, a YouTube channel.

* JAKE HINDS

<HYPERLINK>

A website that takes design cues from the Sublime Text editor, so coders feel at home

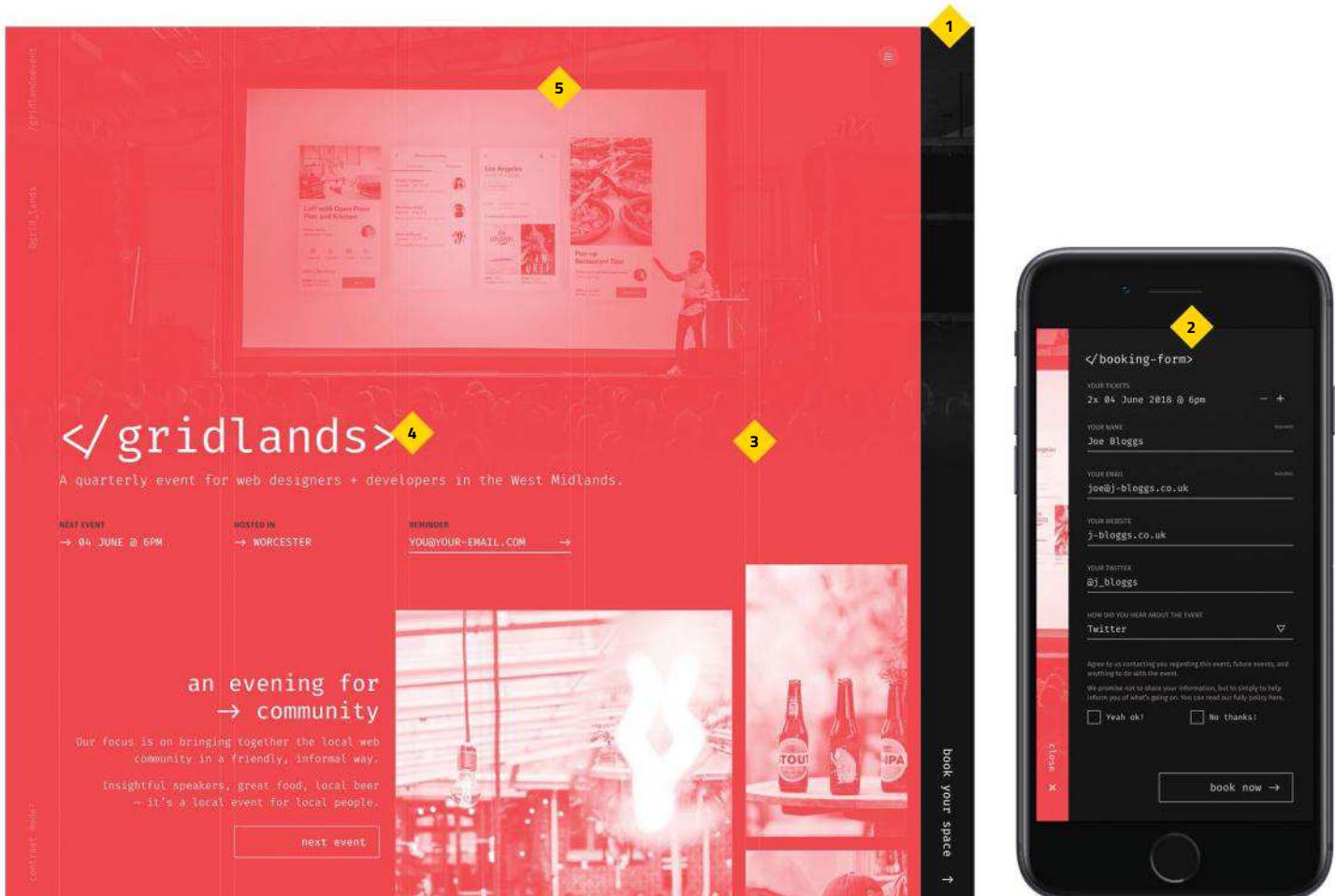
> The <hyperlink> Bristol Web Designer Meetup is a monthly evening event for the digital and creative community in Bristol, combining talks with the opportunity to meet, network and chat with like-minded people.

The design, colour palette and choice of font have all been inspired by the code editor we use at Bopgun: Sublime Text. I used this to appeal to designers and coders alike. Adopting a structured approach (just like lines of code) to make the main information stand out, I have complemented this with contrasting fluid shapes that slowly flow in the background.

Below the title are icons showing key information, including time, ticket price and the main speaker for that event. The call to action, "Register", is the only piece of information with a fluid shape and flows based on mouse movement within a 10px margin container, subtly drawing users' attention to register for tickets.

CLOSE UP

- (1) Keeping "Bristol web designer meet up" in the same blocks but changing the other key information like date and location makes the site easy and clear to use.
- (2) The social feed on the website adds another level of interaction that makes visitors feel like part of a growing and professional creative community.
- (3) The register button takes you to an Eventbrite page that grants access to tickets. The key information is pulled and updated from the Eventbrite API. This tracks the information of the attendees to advertise to friends and colleagues.
- (4) The site would be fully responsive, allowing the user to browse and explore from anywhere and on any device.
- (5) Using blocked out copy for important information and flowing shapes in the background gives a consistent container and graphic style that is used throughout the site to give it easy and fluid navigation.
- (6) The use of flowing shapes in the background adds depth and interest to the site.



TIM BREEZE

GRIDLANDS

A site that showcases what can be achieved with CSS Grid and CSS Filters

I wanted to really think with this challenge about how new CSS technologies could be used in both the aesthetic and development of the site. With an audience of front-end designers and developers in mind for my Gridlands event, I felt this would resonate well.

The end result is a fresh, exciting website full of character that uses design to highlight the technology powering it. From the ever-present scaffolding lines to the duo-tone imagery, the design is focused on sending a message to the right audience. At the same time a balance of typography and layout aims to deliver the key details of the event to users as soon as possible.

The website, being a one-page design, would be built upon Craft CMS to ensure rapid content-development utilising matrix-fields and blocks. It would leverage CSS Grid and CSS Filters to power core design choices and Vue.js to power the hidden drawer and booking form.

CLOSE UP

(1) The sidebar is designed to be fixed and present throughout the users' journey. The aim is to provide a constant call-to-action that doesn't interrupt the content or layout of the page. (2) The mobile design highlights the booking form found in the sidebar. The aim is to quickly and efficiently sign users up to the event no matter the device. (3) The scaffolding lines were influenced not only by the desire to leverage CSS Grid but by researching Müller-Brockmann's 'Grid Systems in Graphic Design'. (4) Throughout the design you'll notice the use of Fira Code. This very specific typeface with its unique text-editor features was chosen to give character to the design. (5) Duo-tone imagery is a key feature of the design; powered by SVGs and CSS Filters they not only help to showcase the event but are part of the user experience too. The sidebar changes colour based on whether it's open or closed.

MY MONTH

What have you been working on/doing?
Working through a website redesign for an information agency, getting better acquainted with Vue.js and dealing with a six-month old Collie pup.

Sites you visited for inspiration?
Site Inspire and Twitter.

What have you been watching?
Bob's Burgers and Silicon Valley but honestly the pup is too loud for much else!

What have you been listening to?
I've been flicking back and forth between the Doom OST, Om Unit mixes and a spot of Noisia Radio all month.



INFO

Location: Copenhagen,
Denmark

Designing since: 2015

Expertise: UX/UI, interaction
design, product design, graphic
design, print design, web
design, front-end development,
illustrations

Clients: None currently



*PROFILE

SIGNE ROSWALL

signeroswall.dk

The Danish designer tells us about the challenges of freelancing, making design enjoyable and inspiring users to just be human

> What do you do when the project you're working on suddenly expands massively in scope and it's down to you to deliver? Signe Roswall (signeroswall.dk), a full-stack designer at Napp (napp.dk), faced that challenge when a project redesigning the website for the company's publishing platform, Siesta, transformed into converting it into a partner relationship management system. Signe caught our attention with her detailed report into her process (<https://blog.prototypr.io/lets-redesign-the-entire-platform-they-said-ccd267cad262>). We decided to find out more about her.

Hi Signe, can you tell us a bit about yourself and your background?

Hey there! My name is Signe [SING-neh]. I just turned 25 in April. I live near Copenhagen, Denmark with my boyfriend Christian and my cat Anton-Loke.

I've always wanted to pursue the creative career path. When I was 18, I took a one-year class in web design at a production school. My first websites were really shitty-looking but I genuinely enjoyed making them. Since that life-changing experience, I've completed one and a half vocational courses in web development and graphic design. While studying, I also worked either in a student position, as an apprentice or as a freelancer.

Photographer: Alex Nyborg Madsen

A/B test



- When you were a freelancer you often prioritised your own personal projects over paid work. Why?

Honestly, I had a hard time finding work that offered a decent payment, if any at all. I saw multiple freelance and part-time positions straight up marked as unpaid, not to mention all those terrible "\$5 for a logo" sites. Most who contacted me offered me equity in their completely new companies or promised payment later on if the project could be funded – extremely high risks to run for me, just to get work. It was both frustrating and disheartening but I simply couldn't afford to do those projects in the long run – financially or mentally. So I chose to follow my gut, turn them down politely and focus inwards instead.

Through the personal projects, I became a better designer. I rediscovered my passion and earned incredible recognition for my work. I found a way to combine my love for writing with my love for creativity and creation. Meanwhile, I got my first returning client, the Student House, with the Student Refugees project. It was for a good cause and they actually offered me a really decent pay for both projects. I'm not in it only for the money but I did skip the unserious work opportunities in favour of some good ones. I'd be a terrible business person if I didn't.

How does the industry get it so wrong with freelancers?

Blaming the industry, to me, feels like dodging the responsibility. As people



One of Signe's first freelance projects was a logo, illustrations and web graphics for Student Refugees

The new Napp Siesta



Napp's Siesta platform has seen the very best kind of mission creep, evolving from a simple publishing platform to a fully fledged relationship management system

working in it each and every day, we are the industry – or at least a major part of it. I actually sought advice from other freelance designers about the issue of low-paying projects and they straight up told me I had to sell myself cheap in the beginning to get work and clients. "That's how we all did it, that's just how it's done." I hated that answer so much and yet I found out I'm no better myself. Quite recently I tried to get another creative to work for me for free. Before I could realise it, the words were out of my mouth: "I'm looking for someone who would do it for the exposure..." Ugh! I could've bitten my tongue right off.

Exposure doesn't pay rent: I know this from very recent, painful, personal experience. So I apologised, very ashamed, and paid up. And I'm really glad I did because the collaboration turned out to be a really creative, fun and inspiring experience. We need to ask ourselves if we would accept what we're offering if the situation were reversed. The change starts with us.

As a full-stack designer, where does the job start and finish?

As a full-stack designer, the job never finishes! To me, saying full stack is an attempt to rebel against the common

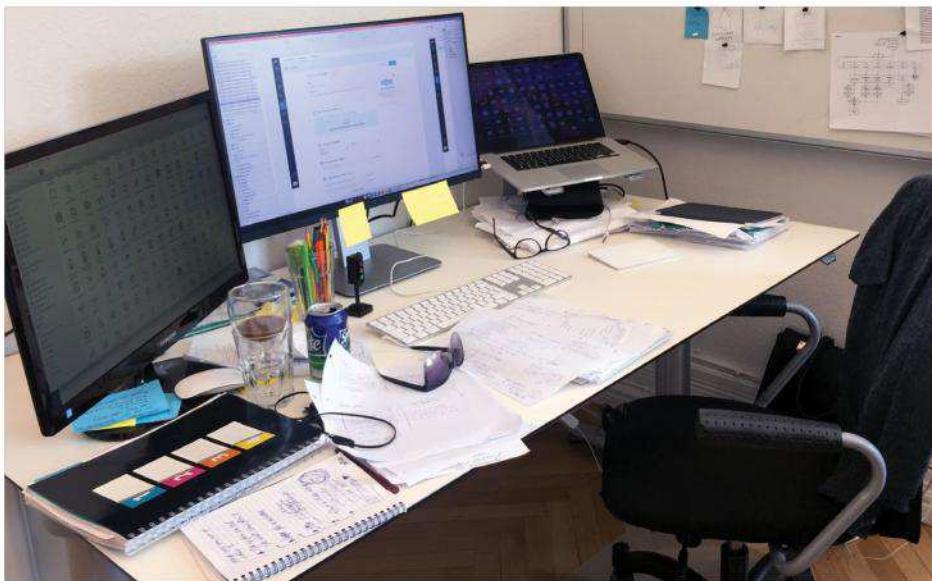
misconception that I'm some designer-derpette who cares for nothing other than perfect pixels. I enjoy being involved in a process from initial idea to implementation, working with creative strategy, design and even sometimes development.

How would you describe your current workflow/tools?

My workflow changes depending on the assignment. Sometimes I start with pen and paper or open up Sketch right away; other times, my work begins with people. But my favourite tool is the big whiteboard and markers in the office; they let me sketch out ideas freely. I guess I'm kind of old-fashioned that way.

You've written that design needs to be enjoyable. How does that feed through into your work?

I believe when facing multiple choices, we're inclined to prefer the service or product that offers the most enjoyable experience. When I chose my mechanic, I called two different garages in my local area. One was a grumpy dude who felt he needed to lecture me about cars, the other was polite and remembered my name at the end of the conversation. Guess who I chose?



This is where the magic happens. Signe cites her desk at Napp as evidence that she's a messy person but, honestly, we've seen much worse in our time

I try to let those encounters inspire me to make my designs a better experience for the people who use them. I can only discover exactly how to do it by getting familiar with them as people and learning what they enjoy and prefer. If they prefer using Excel for their work, for reasons I have a hard time comprehending, I should make an effort of integrating options for Excel into the design.

Many modern apps can be over-intrusive and you addressed that in a redesign of a travel planning app. Tell us about that.
I believe we're nearing a point where people are getting fed up with all the forced commercials, data-sucking and stress-inducing apps, services and companies bombarding them day in and day out. Constantly having a probe up our behinds and some stupid computer telling us to do better gets tiring at some point, especially if you're actually paying for it. Lose weight, get rich, get better, get healthier, buy more, do more, be more, work more, sleep more! It's not healthy.

With rising trends such as emotional design and empathic design, there's a wish to actually be the good guys and create designs that genuinely help people in a non-intrusive way without making them feel like shit all the time for not having

walked enough fucking steps today. This is exactly what I tried to channel with the Travel Planner app. I didn't want to force people to use "Explore" – the feature I added in the redesign. I didn't want to force them to go to commercial places or cheat them into buying stuff, reducing them to mere consumers. I wanted to stop them in their tracks and inspire them to go somewhere where they can enjoy doing nothing, maybe look at some nature and just be human.

Denmark's public transportation company relaunched its ticketing app with serious usability issues, so you were brought in to redesigned it. What did you learn from the experience?

I learned complaining alone gets you nowhere but fixing what you think is broken is where it gets really interesting. It's no secret I'm a pretty opinionated person; it's actually what drives me to do good work. But I used to think I couldn't voice my opinions publicly or use them in my career, that I wouldn't be an attractive employee if I was honest about myself. Through that project, I found a way to unite my personal opinions and professional work. Now I care more about just being myself and being honest as often as I can.



★ SPOTLIGHT



SIGNE ROSWALL

What's on your desktop?

A mess of papers, post-its, pens, notebooks, glasses and the occasional coffee stain or two!

Little things that make your life worthwhile

Websites: Medium, Dragon Age Wiki (Fandom), Behance

Apps: Messenger, Google Books, YouTube
Audio: A lot of different music. I couldn't possibly name only a few!

Reading: The Witcher series by Andrzej Sapkowski, Susan Weinschenk

What do you have on the walls?

More messy papers – just vertically instead of horizontally!

What will you do for lunch?

Eat far more unhealthily than I should and probably top it off with a soda

What hours do you work?

8-4

What else do you do in the office?

Well it's an office, so I work! Never too busy to goof around with my crazy colleagues, though

How often do you hang out with other designers?

Only when I'm at Meetups, which happens very rarely these days

Describe your working culture in three words

You. Betta. Work!
- RuPaul



★ TIMELINE

Key dates for
Signe Roswall

2013

Enrolled in vocational education in
web development

2014

Began working as an assistant
web designer for an animal
welfare organisation

2014

Completed web development course
and entered into a media graphics
design apprenticeship

2016

Decided to quit apprenticeship
halfway through

2017

Began working as a UX/UI designer for
a fintech startup

2017

Made the jump to become a full-time
freelance / independent designer

2017

Published a design article about first
personal project and was featured in
Prototypr on Medium

2017

Completed first official project as an
independent designer

2017

Applied for a freelance designer
position at Napp, which ended up being
a full-time gig

2018

Published article about the redesign of
Napp's SaaS platform



Signe and her sister Asta are both serious fans of the Dragon Age: Origins companion Alistair – to the point where Asta is considering naming her unborn child after him

► **What does your job with Napp involve?**

I'm actually the only designer at the moment so my work spans all the way from day-to-day assignments, such as graphics, social media banners and landing pages, to large scale projects like designing the new visual identity for its SaaS product Siesta and working on the UX/UI design for the platform. One or two smaller client assignments also snuck in there somewhere.

You redesigned Napp's Siesta publishing platform and it turned out to be a much bigger job than you anticipated. How did you cope?

Honestly, I remember I complained a lot about it when I got home to my boyfriend. It was in many ways too big a mouthful, even for me. But, at some point, I just had to get over myself and do my job. Like my father once told me: "Sometimes you just have to mow the field." I'm also lucky to have some really great co-workers who're always up for a laugh or a quick break. Together, we somehow managed it. It was a crazy process but also a pretty awesome feeling when it was finally launched.

What are you working on at the moment?

Lately I've been focusing more on Siesta as a product designer, following designs from

initial idea to final mockups. Usually I'm introduced to a concept, idea or feature that needs to be visualised and I start working from there.

You also work as a more traditional designer and illustrator. Is it useful to have a broad range of creative skills?

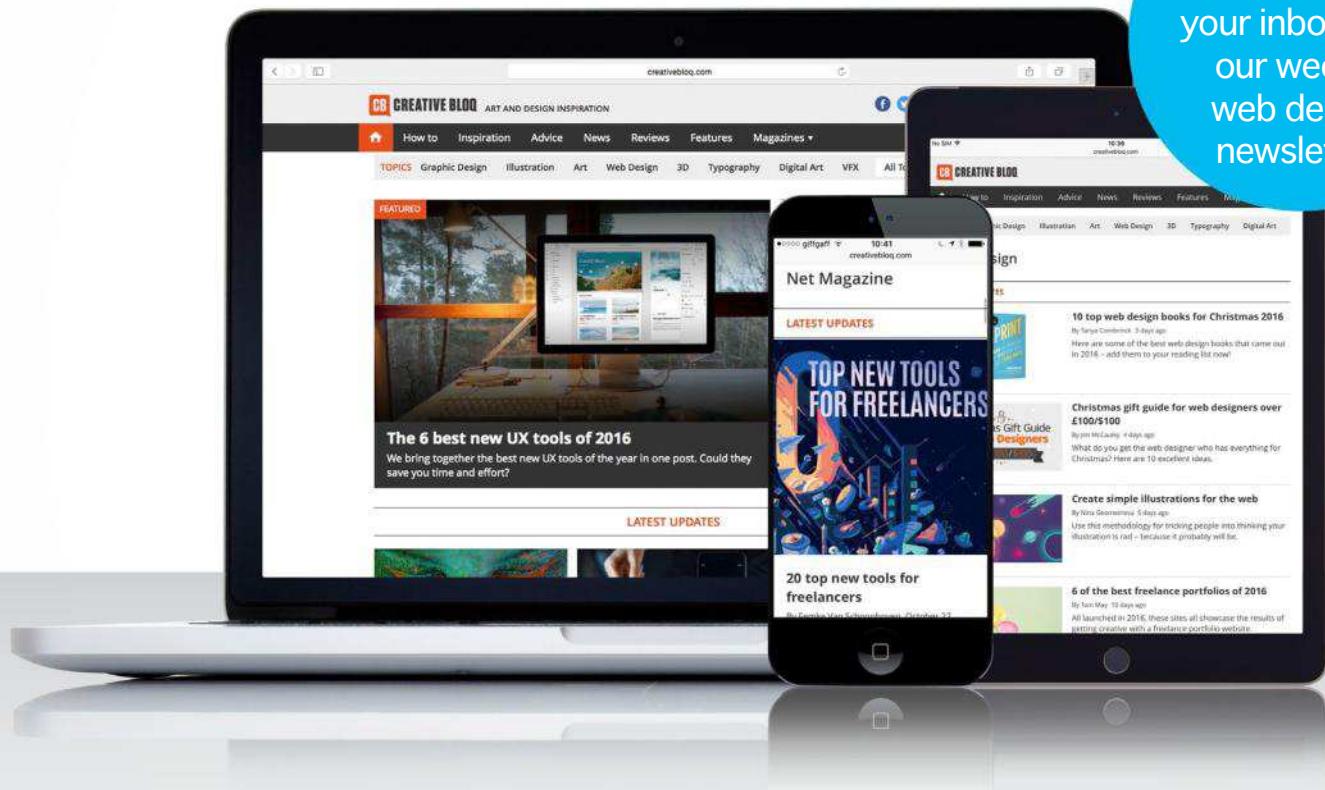
It's useful for me since I've mostly been in positions where I either had to do the work alone or was the only one who had an inkling of how to do it. Sometimes I think about the saying how a jack of all trades is a master of none. Admittedly, I'd like to specialise more in a specific area; it's just really hard for me to choose!

How do you unwind?

I unwind through several consecutive hours of gaming. I'm currently playing Dragon Age: Origins as a dual-wielding female elf who's romancing the living shit out of Alistair. He's a companion in the game that my sister Asta and I are completely obsessed with. We've even gone as far as talking about naming her unborn son after him. I also really like designing and moulding wax models for making jewellery using the lost wax casting method together with my mother. My latest jewellery creations are some dragon earrings for my sister. ■

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★ HOW WE BUILT

OPENACTIVE

We look behind the scenes of a new initiative that harnesses the power of data to help reduce inactivity in England



Using data to help people get active

Helping physical activity reach everyone

We are supporting innovation to help people get active.

OUR VISION WATCH VIDEO

Success Stories

Table Tennis England

Short on time? Activity provider quick start

Reach more customers. Search our list of booking and listing systems to see if yours is already OpenActive-enabled.

Search Our Booking Systems

bookit ClassPass CMZOO ZING

flex.

I DON'T HAVE A BOOKING SYSTEM I HAVE A CUSTOM-BUILT SYSTEM

What we do Our goal is to make data on what, where and when physical activity sessions happen openly available.

Stewarded by the Open Data Institute (ODI), we're a growing community of sport and physical activity organisations and individuals. We're working collaboratively as a sector to open up data about physical activity opportunities.

From leisure operators to national governing bodies, local sports clubs to event providers, walking groups to fitness instructors, the ODI is helping organisations use opportunity data to build interesting products, tools and experiences for consumers.

HOW IT WORKS GET STARTED

OpenActive open opportunity data

Includes details such as:

- How much will it cost?
- When is a court available?
- Where is the class?

But not data like:

- Participation and attendance data
- Commercially sensitive data
- Customer data

Opportunity data

This is data that describes a physical activity including what it is, where and when it's taking place.

5

Opportunity data includes enough information for a participant to decide whether an activity is right for them.

title: "Tennis", description: "Tennis class", remainingSpaces: "12", time: "2017-03-22T20:00:00",

SHOW ME MORE

BRIEF

OpenActive uses data to help get people active. It required an updated website that could provide tools and resources to help members use that data, as well as grow its community and keep it informed. Imagine Creative was brought on board to develop a site that would tick all the boxes.

CLOSE UP

- A new identity was created to accompany the website, which enabled several colour pathways to be used within printed collateral and user journeys on the site.
- This project embraced atomic design theories and, as such, it was decided that the style guide would be built from the ground up to meet the needs of the site as it was developed.
- To ensure new site development and community tooling stays on brand, a pattern library extends the more traditional

style guide and includes markup to guide developers.

- A 'static site' does not mean there are no dynamic elements; for example, a search tool enables users to find the right booking system.
- Guiding users through the correct route to learn and engage with OpenActive is vital to the process. There are simple and advanced explanations of using and sharing data.
- A full icon set was developed to help describe the types of data that can be accessed and their uses.

PATRICE JOHN-BAPTISTE



Marketing and communications specialist who commissioned the project and lead content creation.
w: medium.com/@patrice.jb
t: @patricejohnb

SALLY LAIT



Digital transformation consultant who worked on discovery, strategy and technology selection.
w: <https://sallylait.com>
t: @sallylait

SUSH KELLY



Digital consultant, illustrator and UX designer.
w: www.sushkelly.co.uk
w: www.imagineate.uk.com
t: @maxray

> Stewarded by the Open Data Institute (ODI) and supported by Sport England, OpenActive (www.openactive.io) is a community-led initiative that aims to get the sport and physical activity sector to publish and use data about the details of opportunities to be active. By making this data open, more innovative services like apps, community services and websites can then use it to help promote activities.

As the community grew, the ODI needed a new website that could serve its evolving needs. It commissioned Imagineate Creative (www.imagineate.uk.com) to develop a practical hub to attract new members, provide tools and resources and keep the community engaged and informed of the initiative's progress.

What are the main features of the OpenActive site?

SK: An introduction into what open data is, a search facility to find your booking system and voting to have your system included. The new site contains video explainers, booking system search, a data map and interactive code examples.

SL: The site needed to reduce the burden on the core OpenActive team where possible. We needed to tell the story of what it is and needed a hub for resources and tools for publishers and data users. It had to support a range of audiences, including developers wanting to jump straight in and people who wouldn't even know what open data is.

Tell us a bit about the API dashboard.

SL: The API dashboard (<http://status.openactive.io/>) came out of some research in our standards and developer-engagement stream. We were investigating how to improve the discoverability and usability of data for developers and the dashboard became a focal point. It helps people get an overview of all feeds by sampling the data and also acts as encouragement for data publishers to adhere to standards and fix issues. It was built unskinned and is a good example of how we can apply the pattern library to satellite tools for the community.

Data standards are a big issue for OpenActive. Can you tell us how you are approaching them?

SL: Very early on we researched the data people were using and sharing: attributes, values and transport mechanisms. It was apparent that there were huge differences and we had to be careful to balance the top-down dictating of standards vs bottom-up growing. We formed a W3C community group that lets members share approaches but also have a dedicated standards lead, Leigh Dodds, to compile specifications. To date, we've created both a data paging and modelling specification and are [currently] working on one for booking.

PJB: A significant challenge with publishing open data is making it widely usable so that anyone can innovate with it. So it makes sense for the community itself to build a standard that works for



*TIMELINE

Key dates in the OpenActive project

OCTOBER 2017

Initial discovery work – understanding community and admin needs, audit of existing website, compiling the potential improvements.

NOVEMBER 2017

Continuing discovery – extended user needs analysis, JAMstack investigation and current code review.

NOVEMBER 2017

Simultaneous procurement process – creation of brief and putting it out to tender, appointing Imagineate Creative.

DECEMBER 2017

Project kicks off – project briefing, discovery review, branding development, UX and prototyping.

DECEMBER 2017–JANUARY 2018

Additional research into the community tools and also the wider service design tying into the website. Further branding development.

JANUARY 2018

Wireframe and prototype testing, creation of the pattern library, development work. Content creation.

FEBRUARY 2018

Accelerator page development and launch. Content creation.

MARCH 2018

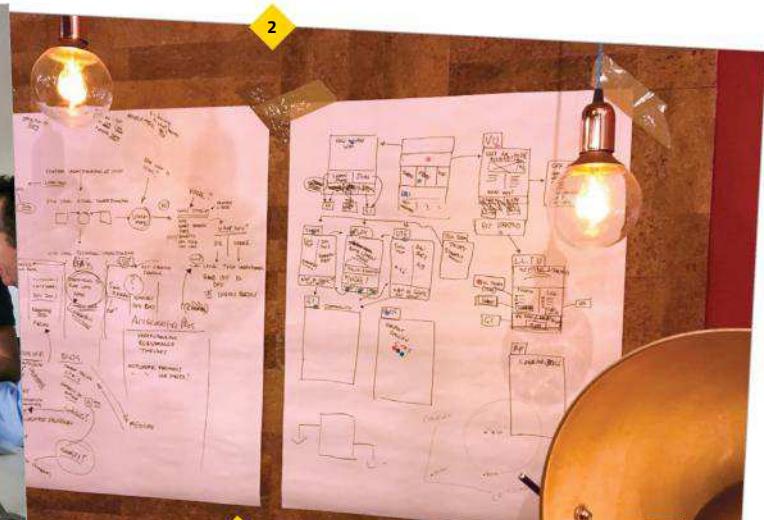
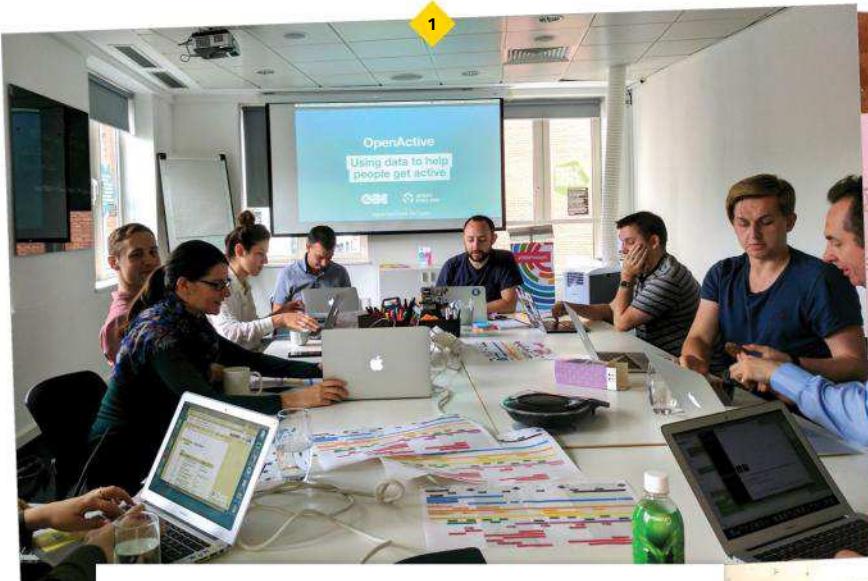
Second phase of development while the website is in beta. Content creation and iconography.

APRIL 2018

Final testing and the switch to the primary domain.

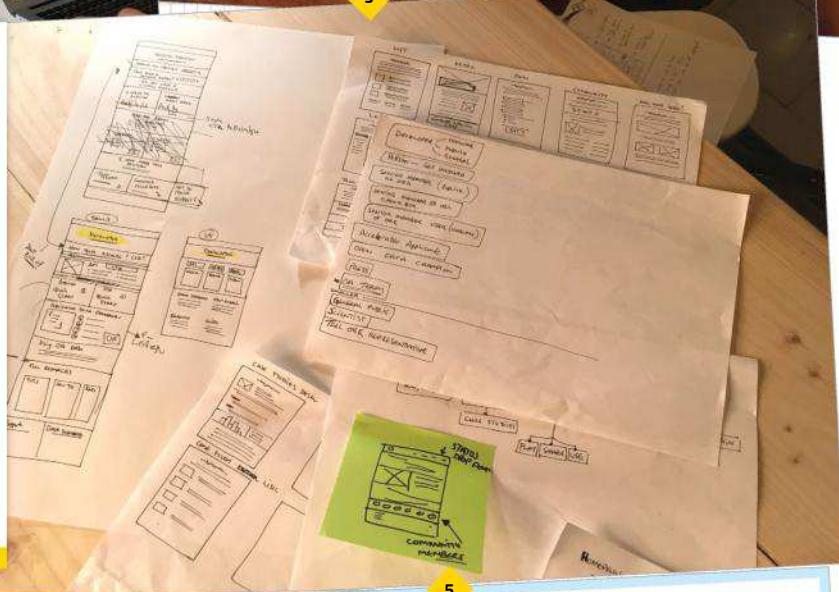
SHOWCASE

How we built



★ EVOLUTION

(1) Initial discovery work – understanding community and admin needs, audit of existing website, compiling potential improvements. **(2)** Taking the data gathered through the workshops to establish a flow through the site. **(3)** Everything starts with a pencil, defining content areas and a hierarchy based on all the research. **(4)** We used Adobe XD on this project to enable rapid prototypes to test internally and with the OpenActive team. It facilitated comments and feedback, which really helped the flow of the project. **(5)** A full brand identity and accompanying style guide and pattern library ensures any future development will maintain visual consistency.



4

THE PRIMARY LOGOTYPE

THE FULL LOGOTYPE

The OpenActive Masterbrand or Corporate Logo comprises two elements, the logo symbol and the logo-type.

The Logo symbol is a powerful image evoking the culture of the OpenActive concept and illustrates the connection of open data.

The Logo Type has been carefully chosen for its modern and yet subtle, slightly organic style. The typeface is Montserrat Bold and has also been chosen to complement and balance perfectly with the logo symbol.

The corporate logo is presented through the use of colour as well as shape and form. The inspiration behind palette is fresh, vibrant, multi-faceted and appealing blend of colours, their strong combination - modern, energetic, corporateness,



1) The Logo Symbol
Evocation of the power of data, connection and community. It's a simplicity often the most striking, angular shapes though reflect on this.

2) The Logo Type
Created for the brand to stand out and yet not overdo, slightly legible weight. The font that best suited here is Montserrat.



Primary Logo
This is the primary version, and should always be chosen on a light or neutral background.

Primary Reversed
Should be used when the logo is placed on a dark background.

Primary High Contrast
Should be used when the logo is placed on a light background.

Primary Low Contrast
Should be used when the logo is placed on a dark background.

Primary High Contrast Reversed
Should be used when the logo is placed on a light background.

Primary Low Contrast Reversed
Should be used when the logo is placed on a dark background.

- the entire sector. Most recently, they are introducing booking into the standard to provide a seamless 'search and book' experience for people who are looking for activities.

How is it that you envisage the data being used?

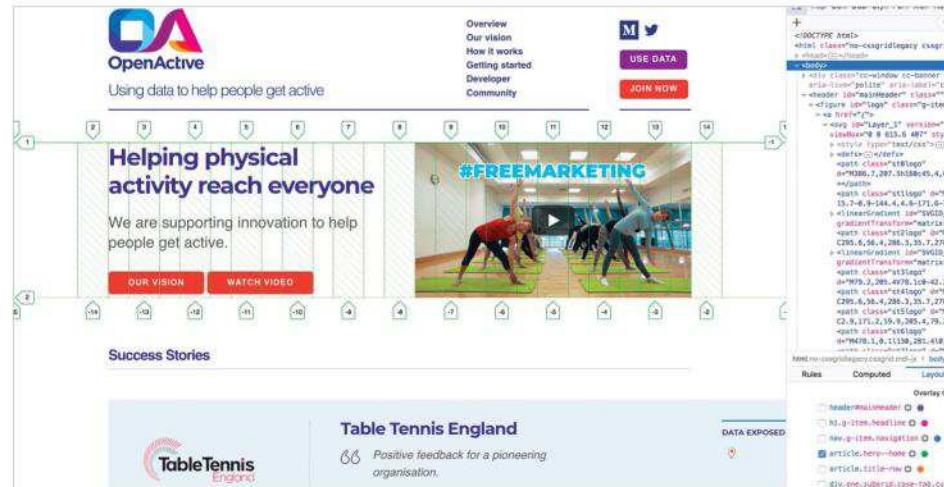
PJB: The beauty of open data is the endless possibilities for its use because it's open for anyone to access, use and share. We want to see the data being used in creative ways to bring opportunities to people both on- and offline.

I'd quite like to see products and services that already collect rich data about personal interests and health – like the Fitbit, travel apps, GP referrals, smart-home devices and social media – progress to use OpenActive data. They could suggest places to workout, join communities and events. The initiative has just launched a startup accelerator with 10 startups who are developing market-ready products and services with the data.

Could you explain some of the technologies running this project?

SK: The site embraces some forward-thinking technology. It is running on a JAMStack (JavaScript, APIs and Markup) platform, Jekyll served on GitHub Pages with a static site CMS called Siteleaf to allow content editing in-browser. The front end itself uses CSS Grid: George really pulled out the stops creating a responsive grid system that included fallbacks for older browsers. The voting mechanism makes use of Firebase to allow functionality far beyond that of a static website. There are many benefits to using a static site such as security, upkeep and portability.

SL: The brief was perhaps more technology-led than most because of the upfront research we'd done and we were thrilled with Imagine's shared JAMstack enthusiasm. By opting for an open, collaborative and sustainable approach centred on core web technologies like HTML and JavaScript, the goal was to make the site portable and accessible for newcomers who may



Embracing the cutting edge while still having fallbacks for older browsers, CSS Grid has changed the way many creatives build websites

Data Tools



The opportunity data dashboard

The dashboard lists all opportunity data feeds currently available. Explore the dashboard to find the data you need, identify which feeds conform to our standards, and provide feedback to publishers.

[VIEW DASHBOARD](#)

The open data map



The map displays all activity data available in England. Explore the map to find the data you need, identify which areas are embracing open data, and which are yet to.

[VIEW DATA MAP](#)

The OpenActive API dashboard provides a point of reference for all the open data available as well as the status of organisations' feed

work on it later (with other nice side effects like helping performance). We were also really keen to think about components and create a pattern library, so the site styles could also be used by community developments.

What's been the biggest challenge?

PJB: The initiative is developing at such pace that the website project had to evolve with it. We agreed a semi-agile approach to accommodate these developments and maintained ongoing communications using Slack, Trello, daily scrums, video calls, GitHub and Google documents in order to work collaboratively and iteratively.

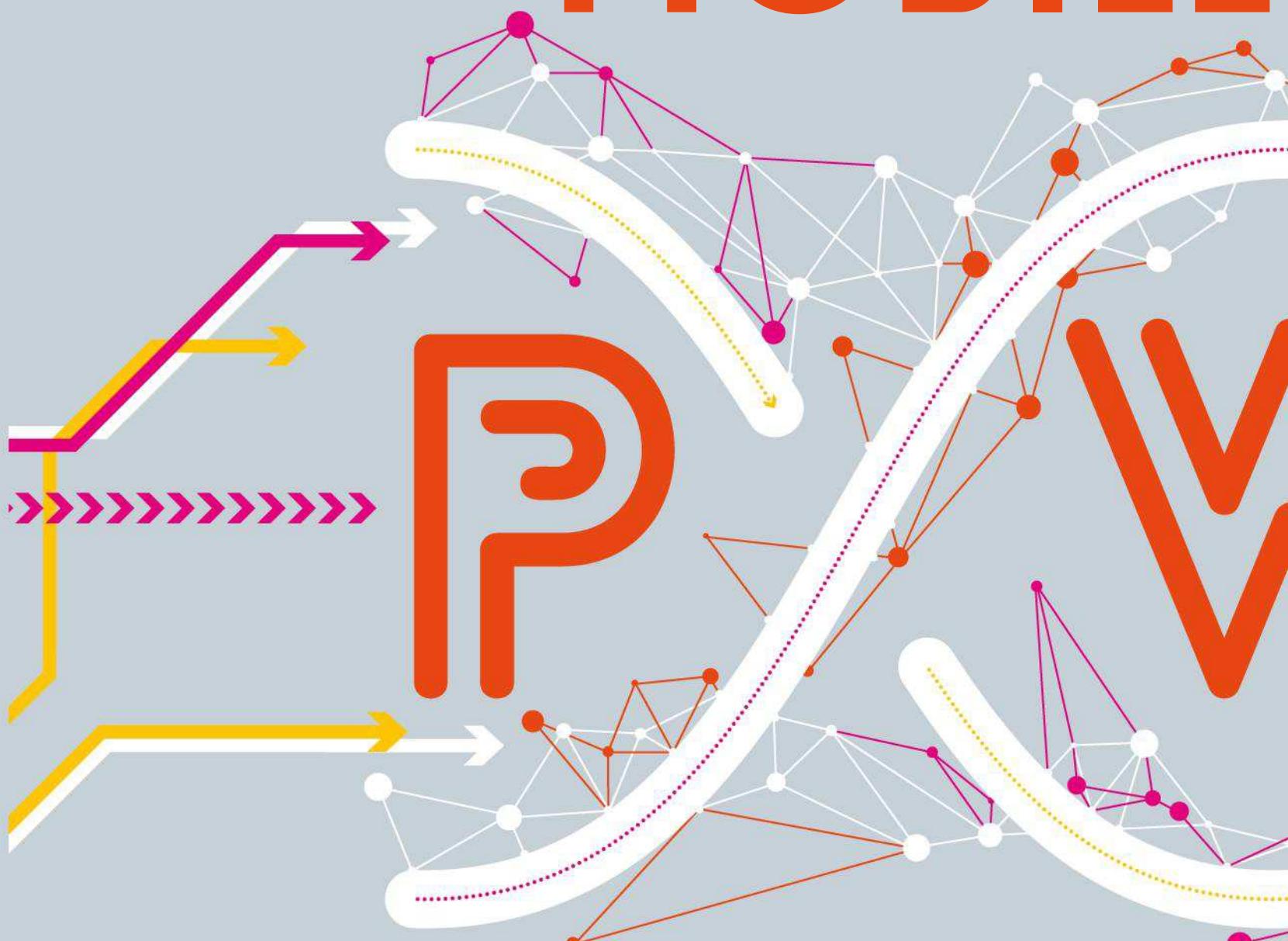
An example of responding to emerging needs is the service-design model created to ease the level of one-to-one engagement between the ODI and new OpenActive members. It required significant structural and content changes to present new guides and tools.

How's the reaction been so far?

PJB: Early responses have been really positive. The old website limited us for a long while. Those that have experienced both sites have called the new one a breath of fresh air! The community has been really receptive to the branding, too. It brings the energy and innovative value that was missing. ■



→ WELCOME TO THE MOBILE

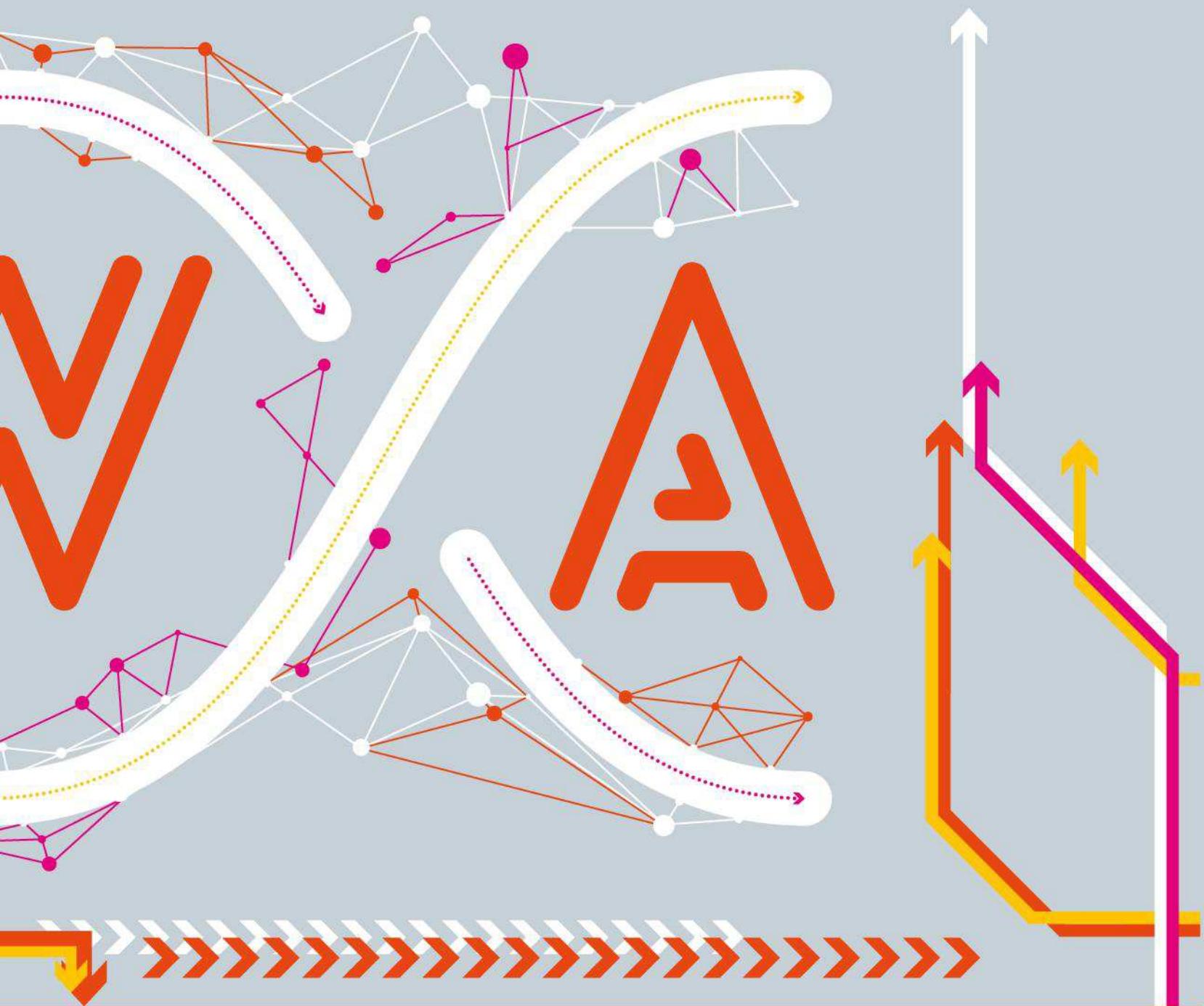


→ The nature of mobile web design has irrevocably changed.

↳ Able to adapt to every available niche, progressive web apps

Welcome to the mobile evolution

EVOLUTION



→ (PWAs) are seamlessly uniting desktop, mobile and app experiences →



ust as responsive web design closed the gap between desktop and mobile sites a few years ago, progressive web app techniques are currently closing the gap between the web and the app world. With user experiences from desktop to mobile apps rapidly converging, it seems as though a much sleeker, more efficient internet is evolving – although inevitably not without some significant changes to its underlying genetic code.

Evidently there are some significant selective pressures driving this. First of all, creating native apps for every niche isn't necessarily an efficient use of resources: users end up with hundreds of big apps wasting bandwidth and valuable disk space and companies spend a great deal of money creating apps only for them to be abandoned after their first versions. And most of these apps are just driven by web content: information coming from web services or a content management system.

The definition of a PWA is not concrete. A PWA is just a web app that uses several new APIs and abilities in the web platform using progressive enhancement to offer an app-like experience on every platform with the same code base. It's more a set of best practices and API usage that creates an excellent app-like experience for your users, so it's not like you have or don't have a PWA; it's more like your site is more or less PWA.

The ascent of PWAs

While the name PWA was coined in 2015 in the article *Escaping Tabs Without Losing our Soul* by Alex Russell working at Google for the Chrome team, their journey didn't actually start there. We used to have HTML Applications (HTAs), which

were created by Microsoft in 1999, along with many other web app platforms from Nokia, BlackBerry and other companies. Then, in 2007, Steve Jobs presented what was at the time the only way to create apps for the original iPhone: PWAs, albeit with a different name. Chrome started from there, improved the APIs a few years later and invented the PWA name.

With so many previous failed experiences trying to bring web content to the world of apps, why do we think it'll work now? Well primarily, it's down to the companies that are now working and promoting the technologies behind PWAs, such as Microsoft, Google, Apple and Mozilla, to name but a few. Also, the performance of the web platform reached a point where there is no perceived difference when you compare a well-designed PWA with a native app. Those conditions have never existed before and that's one reason the web community has decided that the time has come for PWAs.

PWAs in action today

Today PWAs are fully functional and installable on:

- Android with most browsers, with Chrome offering the best experience
- iOS with Safari
- Chromebooks
- Windows 10 from the Microsoft Store
- Feature phones with KaiOS – a fork from Firefox OS – currently available for millions of users mainly in India

Support is also coming to macOS, Windows and Linux through Chrome later this year. It's available today as an experimental flag 'Desktop PWA' if you want to try it now. Installation on

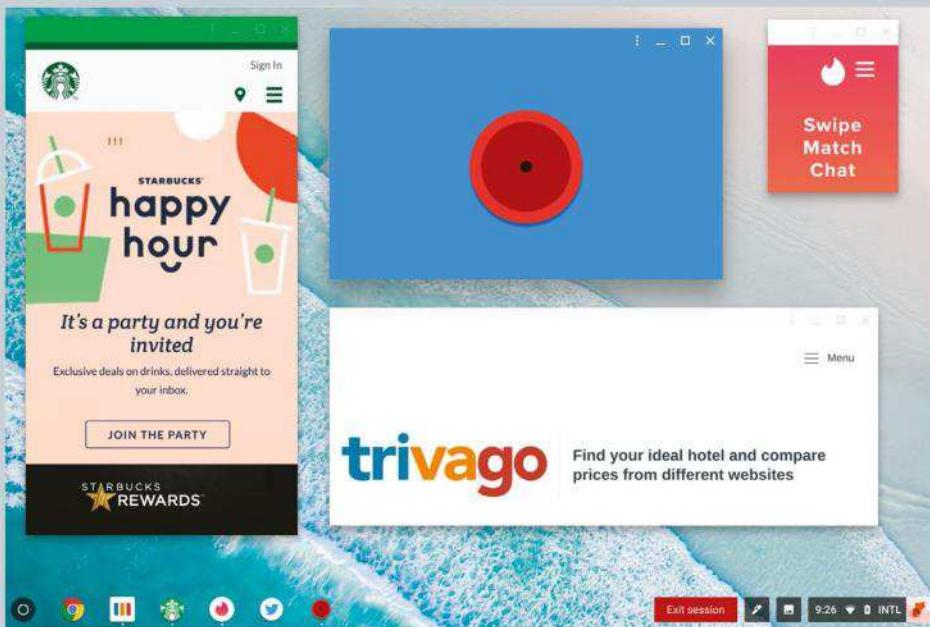
"A PWA USES SEVERAL NEW APIs AND ABILITIES... TO OFFER AN APP-LIKE EXPERIENCE ON EVERY PLATFORM"

AUTHOR

MAXIMILIANO FIRTMAN

Author of many books, including *High Performance Mobile Web* published by O'Reilly Media, Maximiliano is a frequent conference speaker and trainer at online video publishers and top companies around the world.
w: <https://firt.mobi>
t: @firt

Welcome to the mobile evolution



Above With PWAs on desktop, responsive web design has a new meaning as we need to support really tiny viewports and offer a widget-based view of our content

Windows on Edge without the usage of the store is coming later as well, although no specific time frame is defined.

If you reread the list, you can see every platform has or is about to have support for fully installable PWAs in the following months. And because a PWA is just a website with features on top that will be activated only on compatible browsers, we can even say it's compatible with all browsers from its basic functionality.

Also, PWAs are currently being generated from most of the CLIs for

different frameworks, including the Angular 6+ CLI, React Create App, PWA Starter Kit from Polymer and Preact CLI. Finally, the Ionic Framework team came up with the idea of Capacitor [<https://capacitor.ionicframework.com/>], an open-source Cordova replacement that makes native PWAs possible on every app store.

Installation

One of the critical aspects of a PWA is the installation of the app. This process is done in two optional steps: the

CASE STUDIES

Hundreds of big and small companies have already jumped into PWAs, so it's a good idea to test drive some of them to understand the full experience. Here are some to explore:

- Uber <m.uber.com> (mobile only)
- Twitter <mobile.twitter.com> (mobile only)
- Trivago <trivago.com>
- Starbucks <app.starbucks.com>
- Tinder <tinder.com>
- Flipkart <flipkart.com> (mobile only)
- Instagram <instagram.com> (mobile only)
- Housing <housing.com>
- Little Alchemy Game <littlealchemy2.com>
- Financial Times <app.ft.com>
- Lancôme <lancome-usa.com> (mobile only)
- Pinterest <pinterest.com>
- Debenhams <debenhams.com> (mobile only)
- Hobbycraft <hobbycraft.co.uk> (mobile only)
- Redmart <redmart.com> (mobile only)

In case you're wondering, the reason why some companies are only delivering PWAs to mobile devices or Android is because it was the only platform available up until just a few months ago. So if you want to try them on the desktop or another platform, you might want to change the user agent before installing using handy tools such as Chrome DevTools simulator.

Most of these companies are releasing reports about what they gained after moving into PWAs. These are definitely well worth a read to get an insight into what worked – you can check some of these reports at PWA Stats [<https://pwastats.com>].



Left To provide a good user experience for your iOS users you must supply Apple-specific content



➔ P IS FOR PROGRESSIVE

To create successful PWAs, we need to embrace the P in PWA: progressive. This basically means that our app won't look or act exactly the same on every platform. We will instead be enabling abilities based on feature queries but there are also intrinsic differences between platforms that are essential to understand. That won't require a user agent sniffing or creating different versions but it will require adding in some code that will be used only for some platforms.

For Android, we need to define a meta tag in your HTML matching the "theme_color" in the web app manifest that will be used while your PWA works within the browser's context.

On Windows 10, we might have access to some WinRT APIs based on how the app was published in the store. We can detect if we are in that mode asking "if ('Windows' in window)". The list of APIs available can be found at <https://docs.microsoft.com/microsoft-edge/progressive-web-apps>.

iOS added support for PWAs in version 11.3 but its manifest support is still partial in 11, so there are a couple of things you still need to do, such as define iOS icons in meta tags. Remember to follow iOS rules for icons, such as making them square and not using transparency. We need to define what colour to make the status bar – white or black – while for the splash screen Apple supports a way to define bitmaps per device. For iPad and iPhone Plus, you might also want to provide landscape versions using media queries.

iOS also has some other challenges. For example, your PWA will reload every time the user comes back to the app, making OAuth logins unusable and there is no navigation UI so you must provide back buttons within the UI of your app.

► download and offline storage of the app's files and the icon installation in the OS. Because both steps are optional, you can offer an offline experience in the browser or you can offer an icon without offline installation. But a true PWA should include both: it must be served with TLS under HTTPS and the user will decide if they will use it in the browser or within its own installed icon.

Offline and immediate launch

The brain of a PWA is the service worker, a JavaScript file installed on the user's device that is responsible for downloading the app's files, storing them into a cache and later serving them when needed. Once the service worker is installed, it acts like a network proxy for every resource that the web app needs: it can decide to fetch it from the network

```
const resources = ["index.html",  
"app.js", "app.css", "logo.png"]; self.  
addEventListener("install", event => { event.  
waitUntil(caches.open("myPWAcache").then(  
cache => cache.addAll(resources))}); };
```

Then for the PWA to be always served from the cache, we need to listen for the fetch event within the service worker and decide the cache policy to use, such as cache first with the following snippet.

```
self.addEventListener("fetch", e => {  
e.respondWith(caches.match(e.request).  
then(res => res || fetch(e.request))); });
```

In this case, every time the user accesses the PWA (both from a browser or from an installed icon), the engine will get the files from the cache. An advantage of PWAs versus native apps is that devices

"AN ADVANTAGE OF PWAS ... IS THAT DEVICES NEEDN'T DOWNLOAD ALL THE FILES AGAIN WHEN THERE'S A CHANGE"

or deliver it from the local cache, which makes the app available offline and also available in just a couple of milliseconds even if the user has connection, emulating a native app launch.

In order to install a service worker, your HTML document will need to include something like:

```
if ('serviceWorker' in navigator) navigator.  
serviceWorker.register("sw.js");
```

That will install the file "sw.js" onto users' devices for the current folder in the current domain – a concept known as the scope. After it is installed, the next visits to any URL within its scope will be managed by that service worker.

Let's say we have a PWA with four files: index.html, app.js, app.css and logo.png. The first thing is to install those files into the cache in the sw.js file.

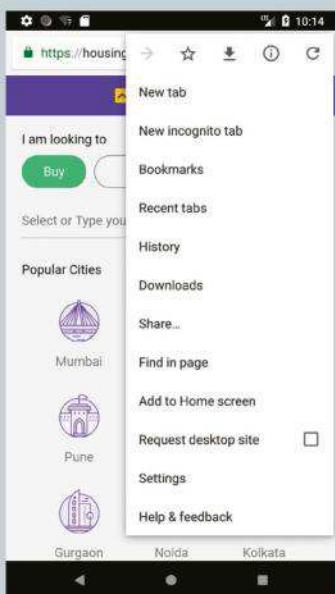
needn't download all the files again when there's a change, only the file that has changed with a transparent process. Also, we can still download parts of the app on demand.

But the challenge is how do you know which files were updated on the server so you can replace them in the cache? If you don't want to write a low-level service worker to manage this, you can use the open-source library Workbox [<https://developers.google.com/web/tools/workbox>], which will help you with the generation of the service worker and the resources manifest to update the installed package.

Be aware that the files of your PWA will be deleted if there is storage pressure on the device unless you request Persistent Storage if available:

```
if ('storage' in navigator && 'persist' in  
navigator.storage) navigator.storage.persist();
```

Welcome to the mobile evolution



Above On different browsers, the manual option to install a PWA's icon is different; on Windows 10, it's just an app in the store

On Chrome and most Android browsers, your app isn't able to use more than five percent of the available space; on iOS it's 50MiB (near 50MB) per host only; in Edge it's variable according to the total memory size and in Windows Store, it's unlimited.

First-class experience

We have the brain and now it's time for the heart: the web app manifest. The purpose of turning a website into a PWA is not just to ensure it is available quickly or while offline but also to enable it to have its own icon in the OS and offer an entirely standalone experience like any other installed app.

The manifest is a JSON file that defines metadata for the PWA used by a browser or an app store in order to define the installation behaviour.

The file defines several properties as metadata for your PWA. Each OS will read these properties and try its best to match the experience you prefer. For example, Android will read "display: standalone" and create a normal app experience. With "display: minimal-ui" it will create an experience with a visible URL and TLS certificate – useful for security-sensitive apps. With "display: fullscreen" it creates fully immersive apps without status bar



The Year of Progressive Web Apps



Above Different ways that browsers have to invite the user to install the PWA; on iOS you have to do it manually

or visible back button. A set of icons and colours defines how the splash screens or title bars will look for your app's window.

There are some manifest generators, such as Web App Manifest Generator [<https://app-manifest.firebaseio.com/>] or PWA Builder [<http://pwabuilder.com/>] that will also resize the icon for you in different resolutions if you provide a high resolution one (minimum 512 pixels).

When you have the manifest file linked in your HTML document, users will be able to install the app using different techniques depending on the browser, typically called "Add to Home Screen," "Install" or just "Add". If your PWA is crawlable by Bing, Microsoft will automatically add it to the Microsoft Store so Windows 10 users will be able to install it from there.

FEATURES

Welcome to the mobile evolution

► On some operating systems, your PWA will have the ability to capture links. This means that after the user has installed the app, any URL within the scope of your manifest will be opened within the boundaries of your app and not in the browser, no matter whether it appears in the browser or other apps such as WhatsApp, Facebook or an email.

If you pass the PWA requirements that we are defining here, some platforms will offer ambient badging (a small icon usually in the URL bar specifying that the web is installable) or a web app banner. If you prefer, you can also add your own custom “Install” button using the following snippet:

```
window.addEventListener("beforeinstallprompt", function(e) { e.prompt(); // will show installation native prompt })
```

If the PWA is installed, the event “appinstalled” will be fired on the window object so you can track stats listening for it.

App stores

One of the major benefits of installing from a browser is being able to avoid the app-store approval process or having to pay to be a publisher. That comes with obvious advantages, such as instant publishing, creating private apps for companies or apps that shouldn’t be accepted in the stores.

The screenshot shows the Microsoft PWA Builder interface. At the top, there's a navigation bar with links to 'PWA Builder', 'Documentation', 'PWA Image Generator', and 'Github'. Below the navigation is a teal header bar with the text 'Generate your Progressive Web App'. Underneath, a sub-header reads 'PWA.tools takes data from your site and uses that to generate cross-platform Progressive Web Apps'. Three large, light-blue circular buttons are arranged horizontally: '1 Generate Manifest', '2 Build Service Worker', and '3 Publish PWA'. Below these buttons is a section titled 'Provide a URL' with the sub-instruction 'Provide your URL and we'll help fill in the gaps if there are any.' A text input field labeled 'Enter a URL' is present. A large white arrow points upwards and to the right on the right side of the page.

Above PWA Builder is a free tool available from Microsoft that will help you in the creation or publishing of your PWA for different platforms online or in the command-line

But some companies do want to be in the store. As of today, the only stores officially accepting PWAs are the Windows Store and the KaiOS Store. Fortunately, with tools like Capacitor (currently in Alpha) or PWA Builder, we can create and sign native packages for other platforms as well.

There are some PWAs already published in the Google Play Store, such as Twitter Lite and Google Maps Go, currently under custom implementations. Chrome will offer a solution from Chrome 68 via trusted web activities. From that point, we will be able to create an Android

package (APK) with a launcher to our PWA and upload it to the store. For the Microsoft Store on Windows 10, the site PWA Builder is currently helping with the generation of an APPX Windows 10 package. Using a web view, you might be able to manually create an iOS app for the App Store but be extremely careful about the store’s rules.

Platform integration

By implementing progressive enhancement techniques, you will be able to use many features, including push notifications, camera and microphone access, geolocation, sensors, payments, share dialogs and offline storage. All of these features run directly within the browser’s security model, including permission dialogs.

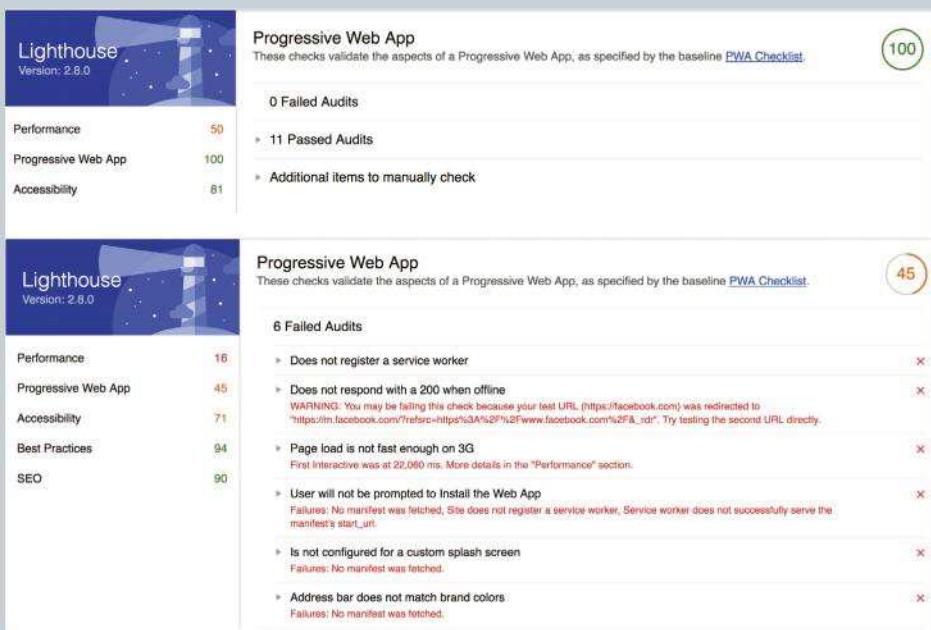
We can also communicate with other apps through URI schemes, such as opening Twitter, YouTube or WhatsApp through their URLs or custom URIs, such as `whatsapp://`.

Finally, when creating native PWAs that are published to the store using Capacitor or to the Microsoft Store, we will be able to bridge to native APIs that will enable us to execute virtually any native code. That integration with Windows 10 includes hardware access but also integration with the OS, offering options such as “Pin to Start.” For example, the



Above A basic PWA in action on different platforms; on macOS, it's still an experiment on Google Chrome

Welcome to the mobile evolution



Above Lighthouse will give you a score stating how PWA your solution is based on a series of tests on a Chromium engine

"A BENEFIT OF INSTALLING FROM A BROWSER IS BEING ABLE TO AVOID THE APP-STORE APPROVAL PROCESS"

Twitter PWA lets you pin any user to your start screen.

Design and UX challenges

Designing PWAs has unique challenges, so it's important to spend some time researching, testing as much as possible and considering the following:

- Users will expect app-like experiences.
- The installation process is still new, so we need to make extra effort to explain how to install the app.
- Updating the app in the background without user interaction is great but it also adds some challenges for the UX.
- On the desktop, responsive web design takes a new frontier as PWA windows can be tiny, much smaller than a mobile viewport. This means we

need to create specific views or small widgets for this format, as seen in Chrome OS today.

- Push notifications should add value to the user only, so learn to ask at the right moment and don't waste the opportunity sending messages that are not useful or interesting.
- We need to design for web performance and for offline access.

The year of PWAs

With the addition of iOS and desktop this year, PWAs are everywhere today. But we need to remember that their journey is just starting, so expect frequent changes and make sure to keep yourself updated with the latest techniques and ideas to deliver an excellent user experience while the platform evolves. ■

RESOURCES

→ PWA Builder

<http://pwabuilder.com/>

Microsoft tool to create PWAs from websites compatible with all the platforms and also to package a PWA launcher for the Microsoft Store.

→ Service Workers Recipes

<https://serviceworkerjs.com>

List of recipes and snippets to apply to service workers.

→ App Manifest Generator

<https://app-manifest.firebaseio.com/>

A very useful online tool that will enable you to generate the web app manifest and all icon versions.

→ Workbox

<https://developers.google.com/web/tools/workbox>

Framework to code PWAs and service workers with a simple to use API.

→ Lighthouse

[https://developers.google.com/web/tools/lighthouse/](https://developers.google.com/web/tools/lighthouse)

Open-source tool to report on your PWA's performance and certain metrics to assess the effectiveness of the app-like experience it creates.

→ Sonar Whal

<https://sonarwhal.com/>

Open-source linter for the web platform that includes PWA checks.

→ PWA Logo

<https://webmaxru.github.io/progressive-web-apps-logo/>

The PWA logo was generated and voted for by the community and as a result it's now used as the standard logo for PWAs; you can download it here or go about generating your own version.

→ Capacitor

<https://capacitor.ionicframework.com>

A packager for native PWAs for Android, iOS and desktop OSs.

FEATURES

Amp up your agile design



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ILLUSTRATOR

NEO PHOENIX



AMP UP YOUR AGILE DESIGN

Daniel Schutzsmith provides insight into the history of agile, why and how you can use it and shares tips from the industry leaders who are using it right now



agile development has evolved quickly over the last 20 years thanks to new methods and tools that make it easier to innovate rapidly. It provides a way for developers, designers and managers to focus on providing the best product to their customers through feedback, iteration, collaboration and adaptability.

For the web, the agile process has provided a fundamental shift in how we deliver products to our users. Let's examine what's involved.

FEATURES

Amp up your agile design



► Don't go chasing waterfalls

Most of us are familiar with and have experience of the traditional waterfall approach to creating a website, where the stages are defined as milestones, with a clear start and end date.

Waterfalls usually consist of four phases: discovery, design, development and deployment.

In the discovery phase, we tend to talk with the client's stakeholders, usually staff or board members that wanted to give input and examples of what they liked for us to follow. Rarely does this stage involve talking with actual customers to get their input.

The design phase uses the outcomes of the discovery to create compositions, usually of a complete page design with often limited rounds of revisions. This is followed by the development phase, which takes the completed page-design comps and builds them to spec, making sure that every pixel is in the proper place in order to execute the masterful vision of the designer.

And finally the deployment phase starts, usually with a beta launch in which quality assurance is carried out on the site for a few weeks. It then launches to the public, sometimes with a beta signifier on the logo as a badge of honour.

The problem with this is that all of your discovery happens weeks, maybe even months, before anything is actually put in front of a customer. Often the features that we assumed would be awesome fall flat once the users are able to interact with them, making our entire effort a partial waste of time and money.

This waterfall process is often cumbersome, costly, time-consuming

and demeaning to the real people who need the product: the customers.

Enter the Agile Manifesto

The modern-day agile development process was sparked by the 2001 Agile Manifesto. It was penned by 17 developers who were fed up with over-controlling management and outdated feature requirements that didn't focus on what the user wanted or needed.

The Manifesto has four key beliefs that provide the foundation of the agile movement as we know it today:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

Even though the Manifesto was born in the early 21st century, it grew from previous development methodologies as far back as the mid-20th century that were agile in nature, such as feature-driven development (FDD), extreme programming (XP) and even Scrum.

Each of these beliefs have tools and resources that make it easy for you to put them in place right now.

Individuals and interactions

A focus on the people that use our products and how they use them is extremely important. In the past, other methods like waterfall have neglected the user and outright ignored their humanity. Human-centred design, also

known as design thinking or agile design, focuses on making us get out of our chairs to interact with people and see how individuals use our product.

There are three key areas of human-centred design: observation, analysis and ideation. Within these areas are some examples that might be familiar, like one-on-one interviews (observation), personas (analysis), or prototyping (ideation), to name a few.

Companies such as Ideo [<https://ideo.com>] and Luma Institute [<https://www.luma-institute.com/>] provide vast resources on how to conduct qualitative exercises with real customers.

Working software

We shouldn't wait for a product to be perfect before sharing it with the world. Customers value transparency and collaboration. Make them happy by giving them working software quickly and improving it consistently.

An often-used buzzword you'll hear that embodies the ideals of working software is minimum viable product or MVP. The concept is that we should ship early and often so the product gets in front of real users to test and improve.

"Using agile principles has offered me a creative problem-solving method at work. In addition to directly impacting business performance, applying agile to my IT projects has driven team collaboration and effectiveness in achieving business results."

Victoria Nwobodo, program and project manager, Worldwide Client Center, IBM



Another popular ingredient used in the creation of working software is to approach it in small cycles. This gives the opportunity to build, test and ship the product every one to two weeks while continuously making improvements. These cycles are called 'sprints'.

Sprints also reinforce your brand in the eyes of consumers. They'll feel content, sometimes even excited, to know you'll regularly be adding new features.

DISCOVER DESIGN / DEVELOP DEPLOY

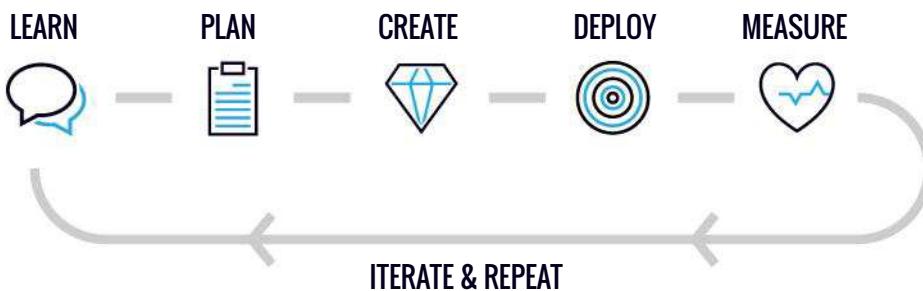


The waterfall process is often cumbersome, costly, time-consuming and demeaning to the real people who need the product: the customers.





Amp up your agile design



Cycle ride Another popular ingredient used in the creation of working software is to approach it in small cycles. This gives the opportunity to build, test and ship the product every one to two weeks

The screenshot shows a Trello board titled 'Agile Sprint Board'. It features five columns: 'Backlog', 'Sprint Backlog', 'In Progress', '8.9.17 Sprint - Complete', and a sidebar. The 'Backlog' column contains several user stories and tasks. The 'Sprint Backlog' column has a single item: '(1) Clicking the collection beneath a board should filter by collection, not open collections pop-over'. The 'In Progress' column contains several tasks, some with attachments. The '8.9.17 Sprint - Complete' column contains a list of completed tasks, each with a checkmark and a brief description. The sidebar on the left provides information about the board's owner, Brian, and various management options.

Trello [<https://www.trello.com>], offers a clear way of managing sprints using a Kanban style of task management that is popular in Silicon Valley.

The project-management application Trello [<https://www.trello.com>], offers a clear way of managing sprints using a Kanban style of task management that is popular in Silicon Valley.

Version control systems such as Git also complement the sprint workflow by being able to commit code, branch it off to try new features, merge it to push to production and even go back in time to bring back previous solutions or see why something didn't work before.

Customer/team collaboration

Your users want to feel heard and acknowledged, especially when your product frustrates them. Creating a culture of collaboration can help you connect to these customers in ways you never thought possible.

A great way to start collaborating with users is to invite them to provide feedback on features that have not been released to the general public yet. This gives you the chance to get an assessment

of how well the features work while giving the customer a sense of inclusion.

"The development methodology is sensitive to design decisions and ideally, said decisions would be best made as teams."



Henri Helvetica, web performance analyst and developer [@henrihelvetica]

Another important way to collaborate is to ensure your team and customer testing segments are a diverse group of people. Create a culture of inclusion that focuses on all ethnicities, genders and abilities. There have been many horror stories in the tech industry where a lack of inclusion ended up alienating a core demographic and ultimately causing the death of a product. Create a culture of inclusion from the beginning and always keep working at improving it.

At the Generate New York conference in April, Dan Mall made an excellent

Case study



Amnesty International USA (AIUSA) adds new features to its website in one- or two-week sprints. This gives it the ability to break down complex features into smaller pieces that can be implemented, measured and iterated upon quickly.



AIUSA then uses a polite smiley face button by Hotjar [<https://www.hotjar.com>] to get instant feedback from customers right when they have something to say.

"If we push something live and users don't like it, we'll hear about it almost right away. It's become a major tool in our arsenal to tell us how we are doing as new features and content are added to the website."

Gabriel Dekoladenu, junior web developer at Amnesty International USA

Another tool it has seen success with is the User Testing service at <https://www.usertesting.com>. AIUSA regularly uses the service to gain visibility into how users think, feel and interact using self-guided tests. In most cases, this provides fast, actionable feedback from real people in a few hours.



AIUSA is now looking to take testing a step further and start administering it across mobile and tablet devices, with the new mobile application launching later this year.

FEATURES

Amp up your agile design



Resources

An important and often difficult part of the agile process is finding tools that can successfully provide quantitative measurements while also providing qualitative testing. Below are some of the best resources we've found that provide both in an intuitive way for your customers and your team. If you are unsure of something, go here for help.



Hotjar

<https://www.hotjar.com>

Hotjar helps designers and developers understand their web and mobile site visitors through heatmaps, session recordings, incoming feedback, surveys and a whole lot more.



Design Kit

<http://www.designkit.org/>

The Design Kit, created by Ideo.org through a Kickstarter campaign, comes with 57 design methods, the key mindsets that underpin how and why IDEO.org believes design can change lives and a full slate of worksheets and case studies from projects that show human-centred design in action.

User Testing

<https://www.usertesting.com/>

With User Testing's on-demand platform, you uncover the 'why' behind customer interactions with real users. By understanding intent, you improve experiences, thereby driving greater satisfaction and loyalty.

► presentation on the importance of creating a common language and trust between your designers and developers. In his talk, Dan equated a roller coaster to the importance of creating a shared experience among the team to design, build and test together – both early and often.

"Designers and developers work best in an agile environment when they understand each other's struggles. Educating each other through lunch-and-learns, story reviews and check-ins, allows your team to grow by learning from each other."

Tessa Kriesel, developer advocate at Pantheon [<https://tessak22.com>]

Respond to change

The needs of our customers are ever evolving. What worked last year will need to work even better and faster this year. Customers come to expect improvement.

To handle this, the agile process forces us to measure what works. Tools like Google Analytics provide a quantitative understanding of where users are going on your site, while something like Hotjar [<https://hotjar.com>] reveals how your visitors are clicking and scrolling. Hotjar provides heatmaps, user recordings and several other features that shows how a customer interacts with your product.

"Launching a product is only half the story; the other half is continuously reviewing analytics and user feedback to make sure the thing you built is actually accomplishing your goals."

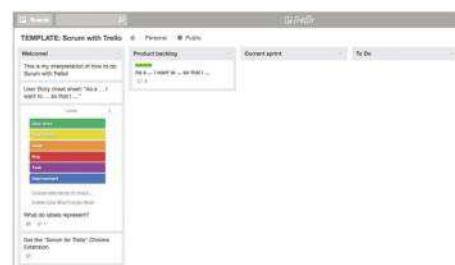
Mario Pabon, software engineer at Underdog [<https://mariopabon.com/>]

Another practical tool is UserTesting [www.usertesting.com]. This tests real users, either yours or ones the tool supplies. They run through questions and talk to you with their microphone as their screen is captured on video. This can become an invaluable asset to gather feedback from a wide array of customers.

Keep in mind that your budget should focus on testing and measurement as



Systems like Atomic Design [<http://atomicdesign.bradfrost.com/>] focus on simple components that can be iterated upon.



Elise Chant provides a free template on Trello to start your own Scrum board. [<https://trello.com/b/ultdy0tY/template-scrum-with-trello>]

much as design and development. It's the only way we can see how users are interacting with a product.

"One of the greatest things about digital product design is that we get to make educated guesses about the way people will use what we dream up. We get to be wrong, and we get to improve upon our mistakes."

Dan Mall, founder and director, SuperFriendly [<http://superfriendly.ly/>]



An important part of responding to change is managing expectations of when new features can be completed or bugs squashed. The Scrum Framework [<https://www.scrum.org/>] combined with a tool like Trello, Jira, or Asana can handle this.

Scrum is an agile framework that outlines the roles of team members, assembles a list of needs called a backlog, defines how to handle sprints, sets a method of reviewing sprints after completion and many other useful tools.

Agile design systems

The movement in web and app design to utilise systems for easier prototyping and testing of smaller pieces of content is another expression of agile design.





Amp up your agile design

The screenshot shows the Amnesty International USA website. At the top, there's a navigation bar with links for 'ACTIVIST RESOURCES', 'OUR WORK', 'GET INVOLVED', 'DONATE', and 'ABOUT US'. Below this is a main content area for an 'Urgent Action' titled 'USA: Grant Clemency to Leonard Peltier (UA 33/16)'. The page includes a photo of Leonard Peltier, a list of steps to take action, and a 'QUOTE OF THE DAY'. Further down, there are sections for 'EXPLORE OUR WORK' featuring 'FEATURED ACTION', 'FEATURED CAMPAIGN', 'FEATURED ISSUE', and 'FEATURED REPORT'. At the bottom, there's a yellow banner with the text 'ACTION FOR HUMAN RIGHTS. HOPE FOR HUMANITY.' and social media links.

Hotjar provides heatmaps, user recordings and several other features that shows how a customer interacts with your product.

Systems like Atomic Design [<http://atomicdesign.bradfrost.com/>] or the Bootstrap Framework [www.getbootstrap.com] focus on simple components that can be iterated upon.

Design systems also make the product future-proof, unlike waterfall designs. They can keep evolving; even across different devices and use-cases, the design system has the capacity to grow.

"The best thing about agile is that it shook up the practice of design... Agile broke the stranglehold of waterfall, and since then, many of us continue to reinvent the way we work, just

as we reinvent what our digital medium can be and do."

Jeffrey Zeldman, founder & creative director, studio.zeldman & A List Apart

Your agile future

We've outlined several ways you can utilise agile methodologies in your work but keep in mind, it's more important you focus on processes than allegiance to specific tools. Take it upon yourself to seek out ways to introduce more collaboration, testing, and measurement into your work. Outline what you want to accomplish and the tools will fall into place as necessary to help you iterate your way to success. ■

Agile Manifesto

The 12 principles of the Agile Manifesto
<http://agilemanifesto.org/principles.html>

Although created in 2001, these 12 principles still ring true today.

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference for the shorter timescale.
- Business people and developers must work together daily throughout the project.
- Build projects around motivated individuals. Give them the environment and support they need and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- Working software is the primary measure of progress.
- Agile processes promote sustainable development. The sponsors, developers and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity – the art of maximising the amount of work not done – is essential.
- The best architectures, requirements and designs emerge from self-organising teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly.





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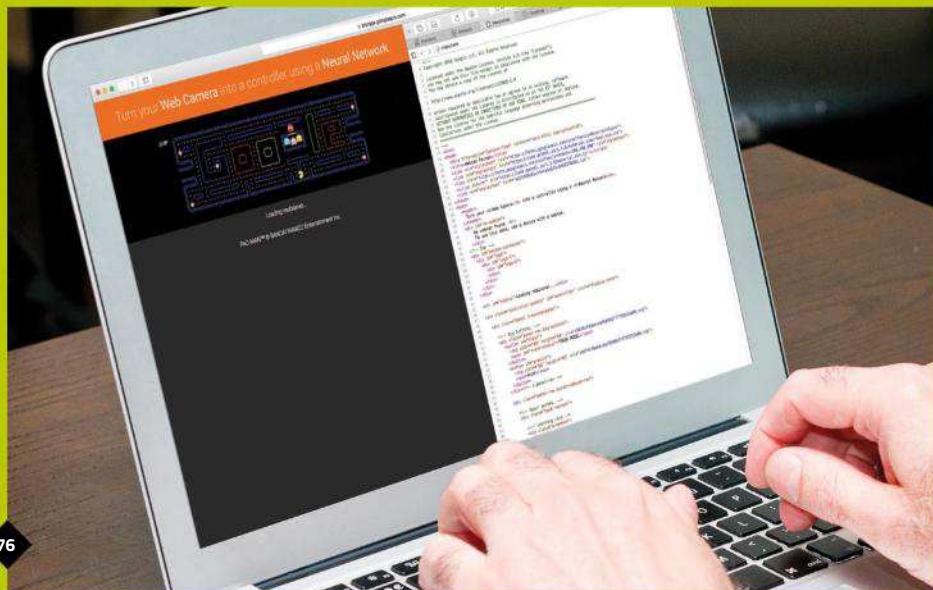


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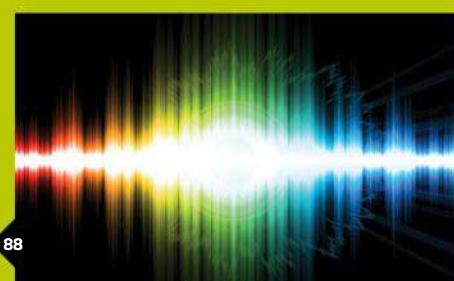


INJECT MACHINE LEARNING INTO SITES USING TENSORFLOW.JS 76



FROM PSYCH GRADUATE
TO A11Y ADVOCATE

87



VISUALISE SOUND USING
SHADERS

88

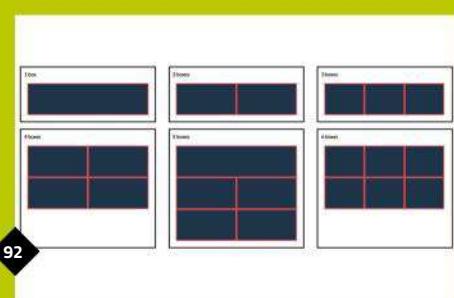
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How it works

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92



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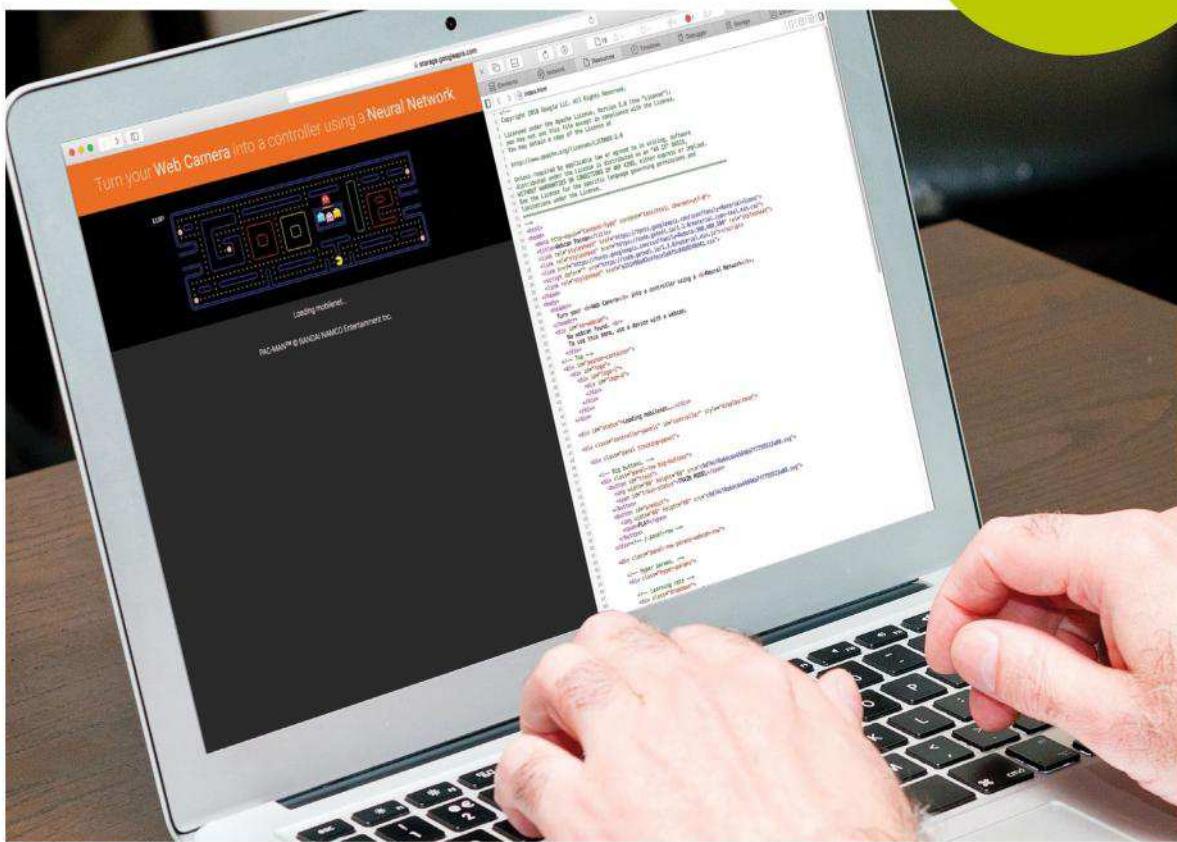
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areas of expertise:

JavaScript, PHP, mobile development

[View source](#)[files here!](#)

All the files you need for this tutorial can be found at
<https://netm.ag/2GOldU>



★ TENSORFLOW.JS

INJECT MACHINE LEARNING INTO SITES

Darryl Bartlett explains how the recently released framework TensorFlow.js can help you create interactive machine-learning experiences right inside the browser

On 30 March of this year, Google announced that TensorFlow would be making its way to the web in the form of TensorFlow.js.

Web developers can now create machine-learning experiences directly in the browser without the end user having to install any drivers or software. Developers can also share their creations with just a link like any other standard website or web app.

One of the great things about machine learning coming to the browser is that web experiences are very interactive, so that users will be able to be fully

engaged in their machine-learning experiences. Browsers also have access to many sensors like GPS, accelerometers and cameras and the data that comes from these sensors can stay right in the client, keeping it a personal experience. Machine learning is the future and now we have a great chance to help build intelligent experiences, which makes it an exciting time to be a web developer.

TensorFlow.js is powered by WebGL and is the successor to deeplearn.js. With TensorFlow.js, we can build and train new models, import pretrained

models for inference and retrain imported models. However, the great thing about TensorFlow.js is you don't need any prior experience with machine learning to start building interactive experiences. There are some pretrained models already available, and it's very easy to get started.

We are going to begin by building a simple image recognition system by taking images from the webcam and then getting a pretrained model called MobileNet to try and recognise what is in the images before printing the predictions to the screen.

GET STARTED

We are going to start by creating a new HTML document called `imagerec.html`. We are going to load two scripts in the header, one will load in the TensorFlow.js library and the other one will load the MobileNet model.

```
<html>
<head>
<title>Simple Image Recognition</title>
<meta charset="UTF-8" />
<script src="https://unpkg.com/@tensorflow/tfjs@0.10.3"></script>
<script src="https://unpkg.com/@tensorflow-models/mobilenet@0.0.1"></script>
</head>
</html>
```

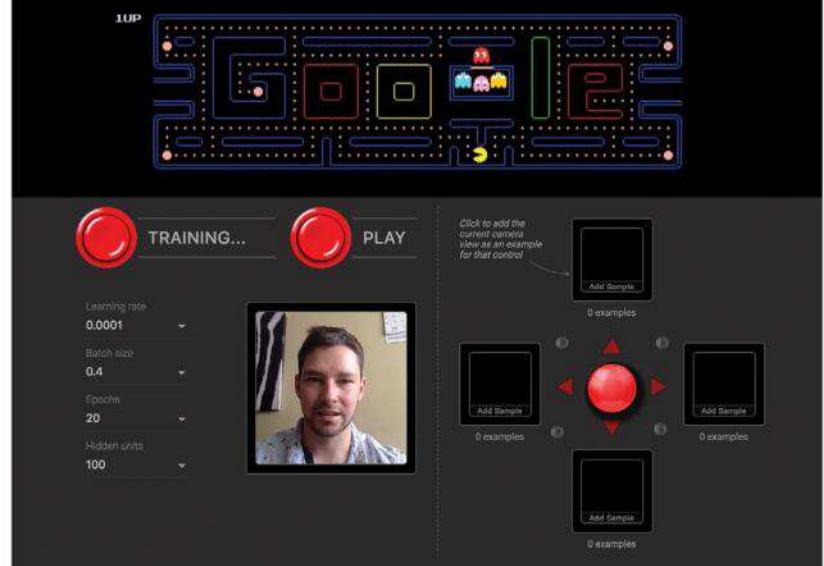
“The great thing about TensorFlow.js is you don't need any prior experience with machine learning”

CREATE THE BODY

When the body is loaded, it will call a JavaScript function called `setup()`, which we will start writing in the next step. Inside the body, we will add in a heading just to introduce the application, in addition to a video, which we will use to capture video from the webcam. We will also add in a canvas, which will be used to take a snapshot from the webcam, and finally insert some preformatted text with the id set to `predictions`. This is where the predictions will be printed.

```
<body onload="setup()">
<div style="text-align: center">
<h1> Simple Image Recognition </h1>
```

Turn your Web Camera into a controller using a Neural Network



```
<video id="video"></video>
<pre id="predictions"></pre>
<canvas id="canvas" style="display: none"></canvas>
</div>
</body>
<script src="imagerec.js"></script>
```

Above There is a great example on the TensorFlow website that enables you to play Pac-Man using images trained in your browser

SET UP THE JS FILE

Next, we will create a JavaScript file called `imagerec.js`. Inside this file, we will first create our `setup()` function. Inside this function, we will first set up references to our video, canvas and predictions elements so that we can use them throughout the rest of the code.

```
function setup() {
let video = document.getElementById("video");
let canvas = document.getElementById("canvas");
let pre = document.getElementById("predictions");
let model = null;
}
```

SET UP A CAMERA FUNCTION

Inside our `setup()` function, we will create an `async startCamera()` function so we can get video from the webcam. We will be using `mediaDevices.getUserMedia` to do this. You will find that `getUserMedia` requires `https` to run, however you can still use `localhost` to test this project. Finally, we will call the function `takeSnapshot()` after every second. Don't panic: we will be creating the `takeSnapshot()` function next – this will enable us to grab a new picture every



- second, to make sure our predictions are always up to date.

```
async function startCamera() {
  let stream = await navigator.mediaDevices.getUserMedia({ video: true });
  video.srcObject = stream;
  await video.play();
  setInterval(() => takeSnapshot(), 1000);
}
```

TAKE A SNAPSHOT

Inside of the `setup()` function, we will next create a `takeSnapshot()` function. If you remember the canvas we created in our `imagerc.html` file, we are going to use this to hold a snapshot from the video. First, we need to get the width and height of the video and then make sure the canvas is the same size before drawing the image to the canvas. The canvas will always be hidden from view, as we don't need to be cluttering the screen with two different views.

```
function takeSnapshot() {
  let context = canvas.getContext("2d"),
    width = video.videoWidth,
    height = video.videoHeight;
  // Setup a canvas with the same dimensions as the video
  if (width && height) {
    canvas.width = width;
    canvas.height = height;
    // Make a copy of the current frame in the video on the
    // canvas
    context.drawImage(video, 0, 0, width, height);
    // Call classifyImage to get predictions
    classifyImage();
  }
}
```

GET PREDICTIONS

This is where MobileNet comes into play. We have now taken a snapshot from the camera and placed it in the canvas – it's now time for MobileNet to make its predictions. We need to create a new function called `classifyImage()`, which is where we will make our predictions with the image taken from the canvas. Our predictions will then be held inside an array called 'predictions'.

```
async function classifyImage() {
  predictions = await model.classify(canvas);
  displayPredictions(predictions);
}
```

We will then pass our predictions on to a new function called `displayPredictions(predictions)`; this

is where we will output the predictions to the predictions area we set up in our HTML file. Before its output, we will fix it to two decimals, so we can show off a percentage. By default, three predictions will be printed to the screen.

Remember that this picture will change every second, as that's how often we call the `takeSnapshot()` function, so it will always be getting new predictions. We will also make sure to print the predictions to the console as well.

```
function displayPredictions(predictions) {
  let val = "";
  for (prediction of predictions) {
    // For each prediction we will get the probability and
    // times by 100 and fix to 2 decimal places
    let perc = (prediction.probability * 100).toFixed(2);
    val += `${perc}% | ${prediction.className}\n`;
    console.log(val);
  }
  pre.innerHTML = val;
}
```

FINISH UP

Finally, we need to add a piece of code that will run once the function `setup()` has been called. This will load our model and also start the camera function for the first time.

```
async function main() {
  model = await mobilenet.load();
  await startCamera();
}
main();
```

“PoseNet lets you estimate poses and will detect body parts like eyes, noses, shoulders, and their position”

We are now ready to run the project. Remember that this current model will not detect humans and won't always be 100% accurate but it's a great start.

POSENET

There is a great model available called PoseNet that lets you estimate single or multiple poses. It will detect body parts like eyes, noses, shoulders and their position. We will create a new HTML document

63.06%	sunglasses, dark glasses, shades	imagerec.js:42
63.06%	sunglasses, dark glasses, shades	imagerec.js:42
36.28%	sunglass	imagerec.js:42
63.06%	sunglasses, dark glasses, shades	imagerec.js:42
36.28%	sunglass	imagerec.js:42
0.13%	loupe, jeweler's loupe	imagerec.js:42
52.78%	sunglasses, dark glasses, shades	imagerec.js:42
52.78%	sunglasses, dark glasses, shades	imagerec.js:42
44.33%	sunglass	imagerec.js:42
52.78%	sunglasses, dark glasses, shades	imagerec.js:42
44.33%	sunglass	imagerec.js:42
0.44%	loupe, jeweler's loupe	imagerec.js:42
71.74%	sunglass	imagerec.js:42
71.74%	sunglass	imagerec.js:42
26.04%	sunglasses, dark glasses, shades	imagerec.js:42
71.74%	sunglass	imagerec.js:42
26.04%	sunglasses, dark glasses, shades	imagerec.js:42
0.49%	loupe, jeweler's loupe	imagerec.js:42
74.22%	sunglasses, dark glasses, shades	imagerec.js:42
74.22%	sunglasses, dark glasses, shades	imagerec.js:42
25.67%	sunglass	imagerec.js:42
74.22%	sunglasses, dark glasses, shades	imagerec.js:42
25.67%	sunglass	imagerec.js:42
0.01%	seat belt, seatbelt	imagerec.js:42
66.26%	sunglasses, dark glasses, shades	imagerec.js:42
66.26%	sunglasses, dark glasses, shades	imagerec.js:42
33.22%	sunglass	imagerec.js:42
66.26%	sunglasses, dark glasses, shades	imagerec.js:42
33.22%	sunglass	imagerec.js:42

Simple Image Recognition



79.58% | coffee mug
16.87% | cup
1.45% | coffeepot

Top The console will log a new prediction in addition to its percentage each time that the snapshot is changed

Above A look at our image recognition application in progress; you will see it picks up the coffee cup on webcam

here to show off a basic example. We won't need an external JavaScript file, as we will place our scripts inside the HTML document.

IMPORT POSENET

Set up a new html file called posenet.html, and import the TensorFlow and PoseNet models in the <head> section.

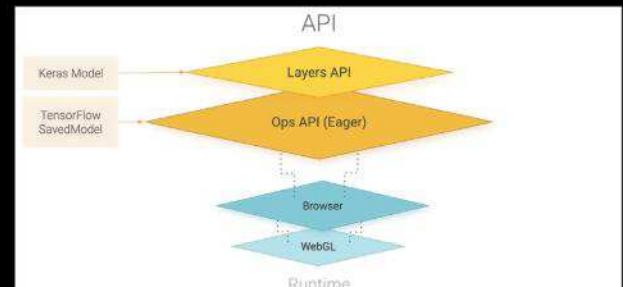
```
<html>
<head>
<title>PoseNet Example</title>
```

FURTHER INFORMATION

TENSORFLOW.JS API

- + We start off with the web browser that does all the computations using WebGL. TensorFlow.js is then made up of two APIs:
- Low-level Core API (former deeplearn.js library) for hardware-accelerated linear algebra operations like multiply and add.
- Higher-level Layers API for building machine-learning models on top of Core, which is modelled after Keras and implements similar functionality.

The TensorFlow.js API enables you to import Python-trained models with Keras or TensorFlow SavedModel and then use it for inference or transfer learning in the browser.



TensorFlow.js core concepts

Even if you are planning to use pre-trained models, it's important to know a bit about the core components of TensorFlow.js.

Tensors

In TensorFlow.js, a tensor is the central unit of data. It is basically a set of numerical arrays with one or more dimensions. The main tensor constructor is the tf.tensor function.

Variables

They are started with numerical array of tensor values. Variables can be changed, unlike tensors. You can allocate a different tensor to a prevailing variable by means of the allocation technique.

Layers and models

Theoretically, a model is a function that gives certain input to create some anticipated result. In TensorFlow.js there are two means to generate models. You can employ operations directly to signify the effort the model does.

Operations

Operations enable you to manipulate data that is stored by tensors. TensorFlow.js offers an extensive range of operations appropriate for machine learning and linear algebra that can be carried out on array of tensor.

★ RESOURCES

ESSENTIAL READING

 Here is a list of resources that will help you on your way with TensorFlow.js and machine learning in general.

TensorFlow.js Project Homepage

<https://js.tensorflow.org>

This is the best place to start; it's full of tutorials and documentation to help get you on your way. There is also a bunch of really exciting demos to show you some of the amazing possibilities, including a webcam controller and a scavenger hunt using a camera.

**Machine Learning Crash Course**

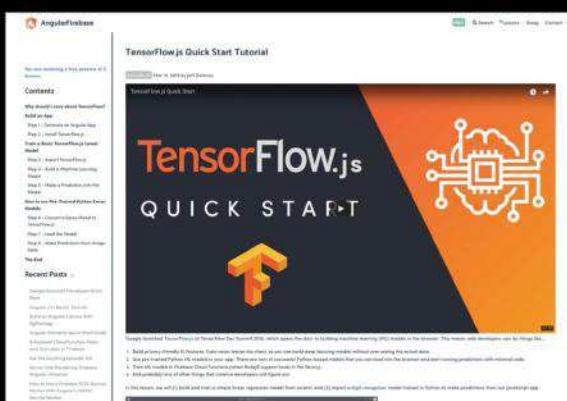
<https://developers.google.com/machine-learning/crash-course>

If you are unfamiliar with machine learning, then Google offers a great crash course that will help you get up to speed.

2018 TensorFlow Dev Summit

www.youtube.com/watch?v=YB-kfeNIPCE

Watch the Machine Learning in JavaScript video from the 2018 Dev Summit on YouTube, where Nikhil Throat and Daniel Smilkov discuss TensorFlow.js and its possibilities.

**AngularFirebase**

<https://angularfirebase.com/lessons/tensorflow-js-quick-start/>

If you are familiar with Angular, then this is a good resource to learn about training a basic model and using pre-trained ones.

```
> <meta charset="UTF-8" />
<script src="https://unpkg.com/@tensorflow/tfjs"></script>
<script src="https://unpkg.com/@tensorflow-models/
posenet"></script>
</head>
</html>
```

SET UP PAGE ELEMENTS

Inside the `<body>` tag, we will put in a header and an image (this will be the one we will want PoseNet to examine). You can grab any image from the web, but if you want one for this example, you can grab one from <https://github.com/darryl-bartlett/tensorflowjs-examples/blob/master/man.jpg>. Keep in mind, it needs to be a human image.

We will also set up an area of pre-formatted text and set the id to 'estimations'. This is where our estimations will be printed for the user.

```
<body>
<div style = "text-align: center;">
<h1>PoseNet Example</h1>
<img id='bodyrecog' src='man.jpg' style="width:400px;">
<pre id="estimations"></pre>
</div>
</body>
```

“You will see we have the results back on our page. This includes both the body part and the confidence score”

SET UP THE VARIABLES

First we need to set up a number of variables, which we will need to pass through for the estimation.

imageElement: First we need the image element, in our case this will be 'bodyrecog'. This is the id we set for our image.

imageScaleFactor: This needs to be a number between 0.2 and 1.0. We will keep it at the default of 0.5. Basically, this is what we need to scale the image to before feeding it through the network.

outputStride: This is the desired stride for the outputs when feeding the image through the model. We are going to keep this at the default of 16. Don't forget that the higher the number, the faster the performance but the slower the accuracy of the results will be.

```

posenet.html:23
▼ Object: [Object]
  ▼ keypoints: Array(17)
    ▼ 0:
      part: "nose"
      position: {x: 202.76112927056346, y: 52.0884933866985}
      score: 0.9944009184837341
      ► proto_: Object
    ▶ 1: {score: 0.9808949828147888, part: "leftEye", position: {}}
    ▶ 2: {score: 0.9892275333404541, part: "rightEye", position: {}}
    ▶ 3: {score: 0.794275990692139, part: "leftEar", position: {}}
    ▶ 4: {score: 0.8386856913566589, part: "rightEar", position: {}}
    ▶ 5: {score: 0.9942143559455872, part: "leftShoulder", position: {}}
    ▶ 6: {score: 0.9966875910758972, part: "rightShoulder", position: {}}
    ▶ 7: {score: 0.9847615957260132, part: "leftElbow", position: {}}
    ▶ 8: {score: 0.9869269728660583, part: "rightElbow", position: {}}
    ▶ 9: {score: 0.9812231063842773, part: "leftWrist", position: {}}
    ▶ 10: {score: 0.7961146235466003, part: "rightWrist", position: {}}
    ▶ 11: {score: 0.9953672885894775, part: "leftHip", position: {}}
    ▶ 12: {score: 0.9882914423942566, part: "rightHip", position: {}}
    ▶ 13: {score: 0.9800722599029541, part: "leftKnee", position: {}}
    ▶ 14: {score: 0.9791433811187744, part: "rightKnee", position: {}}
    ▶ 15: {score: 0.824498176574707, part: "leftAnkle", position: {}}
    ▶ 16: {score: 0.9304854273796082, part: "rightAnkle", position: {}}
    length: 17
    ► proto_: Array(0)
    score: 0.943251255680533
    ► proto_: Object
  
```

flipHorizontal: We will keep this at the default of false. One of the only instances that you might want to set this as true is if you were using a webcam and you wanted the poses to be returned in their proper orientation.

```

<script>
  var imageElement = document.
  getElementById('bodyrecog');
  var imageScaleFactor = 0.5;
  var outputStride = 16;
  var flipHorizontal = false;
</script>
  
```

SET UP THE ESTIMATION

Finally, we need to write the script to feed the image through the model to get back the estimation results. We will first feed through the variables and then output the results for each one.

We will print out the body part and the confidence score to our predictions HTML element as a percentage. However we will also print everything in the console.

```

posenet.load().then(function(net){
  return net.estimateSinglePose(imageElement,
  imageScaleFactor, flipHorizontal, outputStride)
}).then(function(pose){
  console.log(pose);
  //Print a line for each keypoint along with confidence
  //score
  for (i in pose.keypoints) {
    document.getElementById('estimations').innerHTML
  }
})
  
```

posenet.html:23

PoseNet Example



```

  nose Confidence: 98.44%
  leftEye Confidence: 98.09%
  rightEye Confidence: 98.92%
  leftEar Confidence: 79.43%
  rightEar Confidence: 83.87%
  leftShoulder Confidence: 99.42%
  rightShoulder Confidence: 99.67%
  leftElbow Confidence: 98.48%
  
```

```

+= (pose.keypoints[i].part) + " Confidence: " + (pose.
keypoints[i].score * 100).toFixed(2) + "%<br>";
  }
}
  
```

It's now time to run the project. Make sure you are using localhost to run the project or you may get a cross origin error. If you look at the console, you will see that there are a number of attributes you can pull. For example, you can grab the x and y position of that particular part.

Now, if you look at the web page, you will see the results have now been displayed on our page. This includes both the body part and it's associated confidence score.

You could quite easily develop this small application further by bringing in the web cam and even drawing the points on. You can get the full source code for this project by going to <https://github.com/darryl-bartlett/tensorflowjs-examples>.

We have used two pretrained models in our two example projects using the script tags. However, you can convert TensorFlow SavedModel and Keras models to TensorFlow.js using the converter found at <https://github.com/tensorflow/tfjs-converter>.

CONCLUSION

Whether you want to train your own models or use existing ones, there's certainly a lot you can achieve with TensorFlow.js. It is definitely a good place to start as a web developer, especially if you are familiar with JavaScript and you have an interest in machine learning. ■

Left This is the console printing out the array of values including score, part, etc. We are only interested in the score.

Right This is how your final project should look. You have the main image and your set of estimations and parts.



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* WORDPRESS

USING WORDPRESS AS A HEADLESS CMS

What is a headless CMS? How can it help you build more robust, scalable website? What are the benefits to your users? **Benjamin Read** shares all

YOU WILL NEED

- A computer with an internet connection (obvs)
- A code editor (Atom or VS Code)
- A command line shell / terminal
- A recent version of Node.js installed (you can download & install from <https://nodejs.org/en/>)
- A WordPress site to get content from. If you don't have one, you can use the WordPress.com platform (wordpress.com) or this Heroku build pack: <https://www.technomile.com/capabilities/application-development/heroku/wordpress>

GETTING STARTED USING WORDPRESS

 WordPress comes out-of-the box with the REST API and that is what we're going to use to query your data. So we don't really need anything else! Our display site is totally separate from our content site, so we won't need a theme or any other customisation outside a few (optional) plugins. Although of course you can add these if you want to.

The exception is if you need custom meta fields for extra content areas. You're probably using Advanced Custom Fields to do so; you can add that data to the WordPress API by installing this plugin: <https://en-gb.wordpress.org/plugins/acf-to-rest-api/>

USING A STATIC SITE GENERATOR

Now that we have our content source, let's fetch the data and display it using a static site generator (see the boxout *Why use a static site generator?*). My weapon of choice in this realm is Gatsby (<https://gatsbyjs.org>), an excellent static site generator that's built with JavaScript.

If you're looking for a good way to build on your JavaScript skills and learn React by getting stuck into some code, I highly recommend trying Gatsby to do so. I've learned a lot myself by playing with it.

[View source](#)

files here! 

All the files you need for this tutorial can be found at
[github.com/endymion1818/
netmag-wpheadless](https://github.com/endymion1818/netmag-wpheadless)

First, let's install a command-line tool that allows us to create Gatsby sites:

`npm install -global gatsby-cli`

Now, navigate to the folder where you want to keep your site and run this command:

`gatsby new blog`

This will create a new folder called 'blog' and install Gatsby and its dependencies to this folder. Open this folder in your favourite text editor. There might seem to be a lot of files there. Don't worry, we'll only be directly editing the `gatsby-config.js`, `gatsby-node.js` files, and the `src` folder, which is where our templates live.

GETTING OUR CONTENT

The first step we want to take is to fetch our content from the WordPress site's API.

To do that, we're going to install `gatsby-source-wordpress`, a prewritten plugin for WordPress. This illustrates one of the main reasons I love Gatsby – you can get your data from a variety of different sources. A lot of static site generators are restricted to using Markdown files but Gatsby is very flexible.

Gatsby's plugin ecosystem is very mature. There are loads of prewritten ways of getting your data and lots of other clever functionality that comes in useful too.

To install the plugin, first change directory into your new Gatsby site by using this command:
`cd blog`.

Now run this command: `npm install --save gatsby-source-wordpress`.

Once that's done, its time to open up the `gatsby-config.js` file. You'll see that there is already some basic setup in place that Gatsby gives us by

default. We're going to build on that to configure our plugin here:

```
module.exports = {
  siteMetadata: {
    title: 'Gatsby Default Starter',
  },
  plugins: [
    'gatsby-plugin-react-helmet',
    {
      resolve: "gatsby-source-wordpress",
      options: {
        baseUrl: "my-wordpress-site.com",
        protocol: "https",
        hostingWPCOM: false,
        useACF: true,
        searchAndReplaceContentUrls: {
          sourceUrl: "https://my-wordpress-site.com",
          replacementUrl: "https://my-static-site.com",
        }
      },
    },
  ],
}
```

DID IT WORK?

You can check by opening your terminal, typing `gatsby develop` and watch what happens. Be warned! Even if you got your settings correct, you will get some warnings anyway – this may be Gatsby looking for content that you haven't written yet.

You are now able to view `gatsby-starter-default` in the browser.

<http://localhost:8000/>

View GraphiQL, an in-browser IDE, to explore your site's data and schema.

http://localhost:8000/_/graphql

Note that the development build is not optimised. To create a production build, use `gatsby build`.

If the Gatsby default starer (right) isn't what you're getting, check your WordPress site isn't on a subdomain, that it's definitely using HTTPS or HTTP and that you have the same in your settings.

Now we can go to <http://localhost:8000/> and see our Gatsby site!

CAN WE QUERY OUR DATA?

You may have noticed that there is no WordPress content here. This is because we haven't told Gatsby what to do with it yet. Before we do that, let's just check we have actually got our content available to

★ THE BENEFITS OF HEADLESS CMS

WHY HEADLESS?

 I first heard about this approach from a talk I watched from Twin Cities Drupal (<https://www.youtube.com/watch?v=GX9z5M9mz30>). I liked the idea of a seperation of concerns between authoring content and viewing it.

I had already experienced how easily one server can go down, taking out all of the sites on it, leading to minutes or hours of heart-stopping panic (there were 24 on mine). I had also seen how a monolithic CMS-based site could suffer a security compromise and take a lot of effort to repair (that took me more than two days of unpaid work).

I'd seen the benefits of CDNs (content delivery networks) that can store your image, audio and video files on servers optimized for fast delivery and can duplicate those files across the world for speedy delivery to those regions if needed. What if your entire website could benefit from this approach?

I gave a talk at WordCamp London 2018 about this subject, you can find the slides and more references here: <https://wpheadless.indigotree.co.uk>



Gatsby Default Starter

Hi people

Welcome to your new Gatsby site.

Now go build something great.

[Go to page 2](#)

► Above The Gatsby default starter screen

* THE BENEFITS OF STATIC SITE GENERATORS

WHY USE A STATIC SITE GENERATOR?

 Traditionally, when a user visits a site, some code where the website lives kicks into action, getting data from a database, inserting it into templates and stitches page pieces together before sending that code down to the user. This can take quite a bit of time.

A static site generator does all of this before the user gets to the website. Because of this they can be a lot faster and a lot less prone to security risks (because there's no code running behind the scenes on the server). They allow us to have a website with dynamic content (blog posts, pages, products, or any other class of content) which might need extra pages for archives, categories, and a way of making & saving drafts.

Static Sites can be hosted entirely on CDN services like Netlify (<https://www.netlify.com/>) that have generous free plans and take away the worry of managing servers.

I prefer Gatsby (<https://www.gatsbyjs.org/>) because of its healthy plugin ecosystem, adaptable approach to data and because it uses React, my favourite JavaScript framework. In fact, I didn't `_get_` why so many people loved React until I started working with Gatsby.



Above Static site generator Gatsby is a really useful tool built on JavaScript and React."

Gatsby Default Starter

Gatsby.js development 404 page

There's not a page yet at `/help`.

Create a React.js component in your site directory at `src/pages/help.js` and this page will automatically refresh to show the new page component you created.

If you were trying to reach another page, perhaps you can find it below.

Pages (7)

- [/i-really-like-nonsense-posts/](#)
- [/another-random-post/](#)
- [/my-first-post/](#)
- [/hello-world/](#)
- [/404/](#)

Above Gatsby development 404 page showing all of our WordPress posts.

► Gatsby. To do that, visit this url:

http://localhost:8000/_/graphql

This built-in tool is called GraphiQL and is another secret power of Gatsby.

GraphQL is similar to REST: it's a way to query data. But with GraphQL, you can interact with your data much more easily. GraphiQL (a visual IDE for GraphQL) can show us some of these tricks. On the left panel, try typing the following:

```
{
  allWordpressPost {
    edges {
      node {
        id
        slug
        status
        template
        format
      }
    }
  }
}
```

This might look a bit like JSON but it's not. It's a new query language that I think one day will largely replace REST as a way of communicating with APIs.

What did you get when you pressed CTRL + enter in GraphiQL? You hopefully will have seen your WordPress posts and page on the right-hand side of the screen.

We are actually going to use this query in our next step, so keep it handy! You might want to see what other data you can get with GraphiQL whilst you're here. If you want to do that, try moving the cursor around and typing either CTRL + space and / or CTRL + enter. That will reveal other groups of content.

So, we now have content in Gatsby. Next, we need to display it.

DISPLAYING OUR POSTS

For this next step we're going to be making use of the `gatsby-node.js` file.

`gatsby-node.js` is a file you can use to interact with Gatsby's "Node API". Here you can control how your site is generated and create pages, posts and more.

We're going to write some instructions here to tell Gatsby what to do with our data:

```
const path = require(`path`);
```

```
exports.createPages = ({ graphql, boundActionCreators }) => {
```

```

const { createPage } = boundActionCreators
return new Promise((resolve, reject) => {
  graphql(`

    {
      allWordpressPost {
        edges {
          node {
            id
            slug
            status
            template
            format
          }
        }
      }
    }
  `)
  .then(result => {
    if (result.errors) {
      console.log(result.errors)
      reject(result.errors)
    }
  })
  const postTemplate = path.resolve(`./src/templates/post.js`)

  result.data.allWordpressPost.edges.forEach(edge => {
    createPage({
      path: `/ ${edge.node.slug}/`,
      component: postTemplate,
      context: {
        id: edge.node.id,
      },
    })
  })
  resolve()
})
}

```

This code creates pages from our GraphQL query and for each page it'll use a template we've defined (`/src/templates/post.js`). So next, we need to create that file!

CREATE POST TEMPLATE

Inside the `/src/` folder, create a folder called `templates` and a file inside that's called `post.js`. Add to it this code:

```

import React from 'react'
import Helmet from 'react-helmet'

class postTemplate extends React.Component {
  render() {

```

```

    const post = this.props.data.wordpressPost;
    const slug = this.props.data.wordpressPost.slug;

    return (
      <div>
        <Helmet title={`${titleString} | ${siteTitle}`}>
        <h1 dangerouslySetInnerHTML={{ __html: post.title }}>
        </h1>
        <div dangerouslySetInnerHTML={{ __html: post.content }}>
        </div>
      )
    )
  }

  export default pageTemplate
}

export const query = graphql`query currentPost($id: String!) {
  wordpressPost(id: { eq: $id }) {
    title
    content
    slug
  }
  site {
    siteMetadata {
      title
    }
  }
}

```

This uses a different GraphQL query to get data about the specific post it's been fed by the `gatsby-node.js` file, then uses React to render that out into the browser.

If you want to quickly see a list of all your posts, you can type `http://localhost:8000/a` into your browser's address bar. This will take you to a development 404 page, which lists all of your posts. Click on one to visit it!

NEXT STEPS

We've scratched the surface of how to use WordPress as a headless CMS and I hope I've introduced you to some interesting concepts and tools that you might be able to use and experiment with in the future.

There's a lot more to this story and my colleagues and I have blogged about it extensively at Indigo Tree (<https://indigotree.co.uk/>). I've also written more on my personal blog, Delicious Reverie (<https://deliciousreverie.co.uk/>).

Please keep in touch with me via those channels and on Twitter to hear more exciting developments in the world of headless CMS! 

MASTER PHOTOREAL CG PORTRAITS

Portrait artist Ian Spriggs shares the secrets to how he creates his stunning CG masterpieces



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* ACCESSIBILITY

FROM PSYCH GRADUATE TO A11Y ADVOCATE

Zuzana Kunckova explains how working with people with disabilities inspired her to become a web accessibility advocate

When I completed my psychology degree in 2014, I only had a vague idea of what I wanted to do next. My textbooks taught me about the human mind and behaviour, how it functions when all is well and about the ways it can go wrong. I wanted to help people, I wanted to use what I had learned and I wanted to use it well.

To figure out what I wanted to specialise in, I volunteered for Headway (<http://headway.org.uk/>), a UK-wide charity that aims to improve life after brain injury by providing support, services and information to people with acquired brain damage. I was fortunate enough to meet many Headway client and I was able to learn about the various ways brain damage affects people's lives.

One of the ways Headway volunteers and employees support clients is helping them use computers to fill in a form or check email. These were tasks I found so simple, it was hard to comprehend how they could be challenging.

However, I soon realised that using a computer mouse for someone whose fine motor skills have been affected by their brain damage is no easy feat.

Similarly, busy websites full of colour and clever animations posed another issue – clients found it hard to locate the correct navigation menu, button or link. Clients who had any sight damage were very much excluded from the whole experience.

As I was standing in that room, observing clients struggle with navigating simple websites, I realised that if I really wanted to help people, I would need to look beyond the immediate support. I would need to do my part to make sure that the world we live in presents as few obstacles to people with disabilities as possible.

It was there and then that I decided to learn how to make the experience of using websites easier for all users, which led me to web development in general and web accessibility in particular. Developing accessible websites and advocating accessibility has now become my passion and my career.

If there is one thing I learned while at Headway, it would be that no one knows what might happen to them and when.

Web accessibility is not about us versus them. It is about everyone. ■

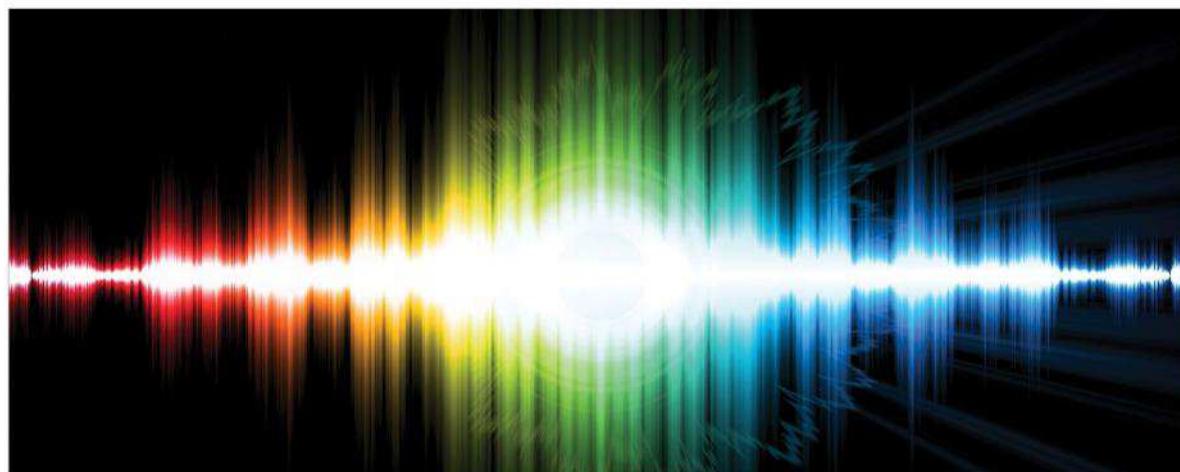
PROFILE * Zuzana is a web developer with background in psychology. She is passionate about accessibility and about applying her psychology knowledge on the web.



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★ WEB AUDIO API AND SHADERS

VISUALISE SOUND USING SHADERS

Richard Mattka explores sound visualisation using a combination of shader programming and the Web Audio API

The Web Audio API enables developers to load external sounds, create new ones and generate amazing effects. Using the analyser node of the audio graph, sound data can be extracted in wave or frequency data sets. Shaders enable a wide range of visual effects by working directly with the graphics hardware of devices. You can create stunning real-time animations powered by sound!

SET UP THE BASIC HTML

Start by setting up the HTML page, including a place for your vertex and fragment shaders and a ‘container’ for your canvas. This tutorial will use the WebGL library three.js to handle drawing to the canvas. Add a reference to the three.js library. You can grab it here: <https://github.com/mrdoob/three.js>

```
<!DOCTYPE html>
<html lang="en">
<head>
  <title>NET Tutorial - Visualizing Sound</title>
  <script src="../libs/three.min.js"></script>
  <script id="vertexShader" type="x-shader/x-vertex">
    </script>
```

```
<script id="fragmentShader" type="x-shader/x-
fragment">
</script>
</head>
<body>
<div id="container"></div>
<script>
// main code here
</script>
</body>
</html>
```

Next, you’ll need global variables to hold some references. Add this code between your script tags.

```
var scene, camera, renderer, uniforms;
var clock = new THREE.Clock();
var audioCtx, analyser, bufferLength, dataArray;
var fftSize = 2048;
var size = fftSize / 2;
```

You need a scene, camera and renderer for the 3D scene and a uniforms object to hold variables being passed to the shader. Use three.js’s Clock class.

For the Web Audio API, you need variables for an audio context, the analyser node, audio buffer length and an array to store audio data. You also set a global value for the Fast Fourier Transform size. A higher value results in more details in the frequency data.

SET UP THE THREE.JS SCENE

To render the shader, use a three.js plane to fill the screen parallel to the camera, with no distortion.

Set up a main init function and call it.

```
init();
function init() {
    //init code
}
```

Inside this function you need to set up a scene, camera and renderer. Then you can target the ‘container’ element, and three.js can create a canvas element inside it. You are also configuring the renderer to full screen.

```
container = document.getElementById( 'container' );
scene = new THREE.Scene();
renderer = new THREE.WebGLRenderer();
renderer.setSize( window.innerWidth, window.innerHeight );
renderer.setPixelRatio( window.devicePixelRatio );
container.appendChild( renderer.domElement );
camera = new THREE.PerspectiveCamera( 45, window.innerWidth / window.innerHeight, 1, 1000 );
```

Next, create the plane to draw the shader onto:

```
var geometry = new THREE.PlaneBufferGeometry( 1, 1 );
```

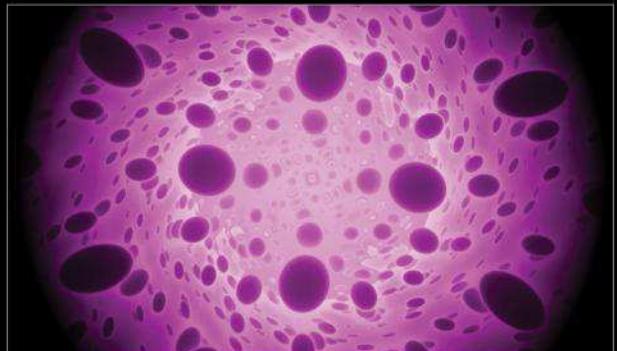
Set up a custom shader material for the plane’s material. You will be converting audio data into a texture and passing it into the shader to use as data. The array size corresponds to the three components, red, green, blue, so we dimension it three times the size of what we need so the audio texture is in the correct vector 3 format. Add the following to do this:

```
uniforms = {
    tAudioData: { value: new THREE.DataTexture(
        new Uint8Array( size * 3 ), size, 1, THREE.RGBFormat ) },
    resolution: { value: new THREE.Vector2(
        renderer.domElement.width, renderer.domElement.height ) },
    iGlobalTime: { type: "f", value: 0.0 }
};
var material = new THREE.ShaderMaterial( {
```

uniforms: uniforms,

★ SHADERS

WHAT ARE GRAPHIC SHADERS?



Shaders can be used to create beautiful generative effects optimised for performance

+ If you are new to graphic shaders, here is a quick primer. Multiple shaders work together in the graphics pipeline. Some are programmable, some are locked to the hardware. We’re most interested in two shaders in the pipeline – vertex shaders and fragment shaders. These are the core of the OpenGL Shading Language and the WebGL graphics pipeline. We’re going to focus on fragment shaders in these tutorials.

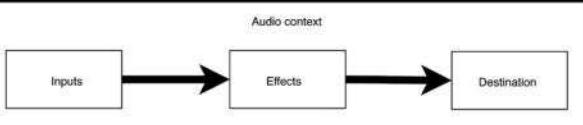
GLSL (OpenGL Shading Language) shaders compile and run on a wide range of platforms. You can apply what you learn to any environment that uses OpenGL, OpenGL ES or WebGL. This means you can use this knowledge for websites, three.js, iOS games, interactive installations, Unity, openFrameworks, Processing and many others.

What is a fragment shader?
This shader, which is typically the last in the pipeline, instructs each fragment or pixel what colour it should be. It does this by setting a value for fragColor in the code’s “main” function. It’s where we’ll create our photo filters, animations, effects and so much more, by manipulating the colours of the pixels.

Vertex shaders
Vertex shaders handle the processing of individual vertices. They take a vertex as an input and return one as an output in a 1:1 mapping. Because we won’t be diving into manipulation of 2D or 3D primitives or geometry, we don’t need to do anything with these to get started. Just know that it is the first step in the pipeline and for now is essentially giving us a canvas to colour.

★ WEB AUDIO

WHAT IS THE WEB AUDIO API?



A simple workflow for web audio, which shows the Audio Context and nodes

+ The Web Audio API provides a powerful system for controlling audio on the web, enabling you to choose audio sources, add effects, create visualisations and much more.

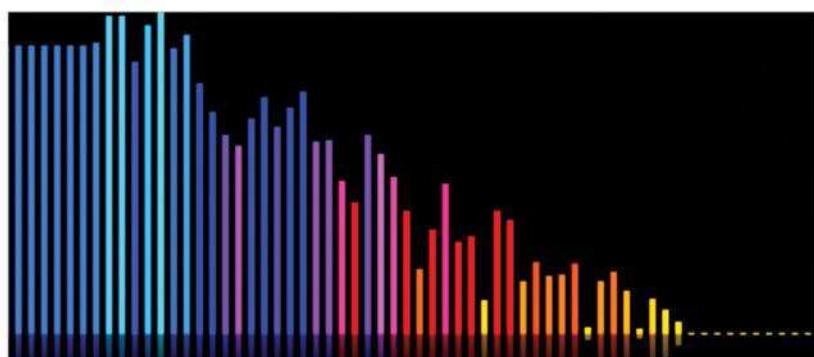
The Web Audio API processes operations inside an Audio Context, which is modular in its design. Basic operations are performed with audio nodes, which are linked together to form an audio routing graph. This design provides the flexibility to create complex audio functions with dynamic effects.

Audio nodes are linked into chains by their inputs and outputs. They typically start with one or more sources, which can be connected to each other, to effects and analysers. They can then be connected to destination nodes to output to speakers.

Analyser node

Using the API's analyser node means that you can extract time, frequency, wave form and other data from audio files. Using features such as `getByteFrequencyData` and then setting the min and max decimal ranges, you can zero in on specific aspects of audio data.

Simple effects that use the overall level (volume) of a music track can make your background pulse in time with a beat. Swells in the musical score can be used to change the opacity of an image or shift its colour. You can visualise the sound in an infinite number of variations.



Above Visualise frequencies as colours and bars; add endless effects to convey the music

```

▶ vertexShader: document.getElementById('vertexShader').textContent,
    fragmentShader: document.getElementById('fragmentShader').textContent
});
```

You now have a custom shader material that uses customisable uniforms (variables) that can be updated in real-time! The code refers to two elements for the two shader types. We have a spot for those in our main code and will add those in after. Create a Mesh that uses the plane geometry and the new material, then add it to the scene.

```

var mesh = new THREE.Mesh( geometry, material );
scene.add( mesh );
//
```

Before we leave this piece, add in an event listener to wait to initialise your Web Audio API code, until the page is loaded and ready to use.

```

window.addEventListener('load', initAudio, false);
function initAudio() {
    // init audio code here
}
```

SET UP THE WEB AUDIO API

Inside the new `initAudio` function, you need to create an audio context:

```

try {
    window.audioCtx = window.
    AudioContext||window.webkitAudioContext;
    audioCtx = new AudioContext();
} catch(e) {
    alert('Web Audio API is not supported in this
browser');
}
```

Now create a Buffer Source to hold the audio data as it loads. Use the XMLHttpRequest to load an external audio file of your choice. Set the response type to an array buffer. Then set the onload event to call the `audioLoaded` function once it's ready.

```

source = audioCtx.createBufferSource();
var request = new XMLHttpRequest();
request.open('GET', 'assets/sabotage.m4a', true);
request.responseType = 'arraybuffer';
request.onload = audioLoaded;
```

HANDLING A LOADED AUDIO FILE

Now that you have the file loaded into an array buffer you can process it. Create the `audioLoaded` function,

which goes inside the initAudio code, right after the previous lines with this code:

```
function audioLoaded() {
    var audioData = request.response;
    audioCtx.decodeAudioData(audioData,
    function(buffer) {
        analyser = audioCtx.createAnalyser();
        source.buffer = buffer;
        source.connect(analyser);
        source.loop = true;
        analyser.connect(audioCtx.destination);
        analyser.fftSize = fftSize;
        bufferLength = analyser.frequencyBinCount;
        dataArray = new Uint8Array(bufferLength);
    },
    function(e){"Error with decoding audio data" +
e.err});
}
```

This takes the incoming response and decodes it using the decodeAudioData method. Then set the source node's properties to use the buffer, filled with the audio data. Using the audio graph, create and connect the analyser node. Connect that node to a destination (your speakers). You can also set the source to loop. Use the length of the buffer, once it's loaded, to define the size of the data array.

Send the request to start the file loading and start the audio source. After that you can call the animation loop to start drawing. Add this code:

```
request.send();
source.start();
}
// start the animation
animate();
}
```

CREATE THE ANIMATION LOOP

To animate over time, draw a new frame to the canvas frequently. To do this we bind the loop to the requestAnimationFrame.

```
function animate() {
    requestAnimationFrame( animate );
    render();
}
```

To handle the rendering we need to grab the audio data each frame and push it into the uniform variables for the shader. Add this code to do that:

```
function render() {
    uniforms.iGlobalTime.value += clock.getDelta() ;
```

```
analyser.getByteFrequencyData(dataArray);
// transfer all frequency data to our data texture
to use in the fragment shader
for ( var i = 0, l = dataArray.length; i < l; i ++ ) {
    uniforms.tAudioData.value.image.data[ i * 3 ] =
dataArray[ i ];
}
uniforms.tAudioData.value.needsUpdate = true;
renderer.render( scene, camera );
}
```

Each frame you increment the uniforms' global time by the amount of time that passed since the last frame. Use the analyser node to grab the frequency data at that moment in time for the audio, then push that data into the audio texture uniform. You skip green and blue values in this model to only use the red channel to store the frequency. You could push other data into the other channels as well. Tell the texture it needs to be updated and then tell the three.js renderer to render the scene.

VISUALISE THE AUDIO DATA

Now that we have a playing audio file using the Web Audio API, all you have left to do is code a simple shader to visualise the data we are passing to it. Between the two vertexShader script tags, near the top of your code, add this:

```
void main() {
    gl_Position = vec4( position, 1.0 );
}
```

Add a simple fragment shader code. Previous tutorials detail how this works. This code will draw coloured pixels where there is frequency and black where there is none to create audio bars. Between the two fragment shader script tags, add this:

```
uniform sampler2D tAudioData;
uniform vec2 resolution;
uniform float iGlobalTime;
void main() {
    vec2 uv = gl_FragCoord.xy / resolution.xy;
    vec3 backgroundColor = vec3( 0.0 );
    vec3 color = vec3( .3,.3, 0.9 );
    float freq = texture2D( tAudioData, vec2( uv.x, 1.0 ) ).r;
    float h = step( uv.y, freq );
    gl_FragColor = vec4( mix( backgroundColor, color, h ), 1.0 );
}
```

You should see a bar graph animation, visualising audio data. This shader is simple but it's just the beginning. There is much to explore! [n](#)



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CSS, JavaScript, Angular

View source

files here!

All the files you need for this
tutorial can be found at
[https://codepen.io/
hungryPhilomath/pen/vjQXLb](https://codepen.io/hungryPhilomath/pen/vjQXLb)

* CSS

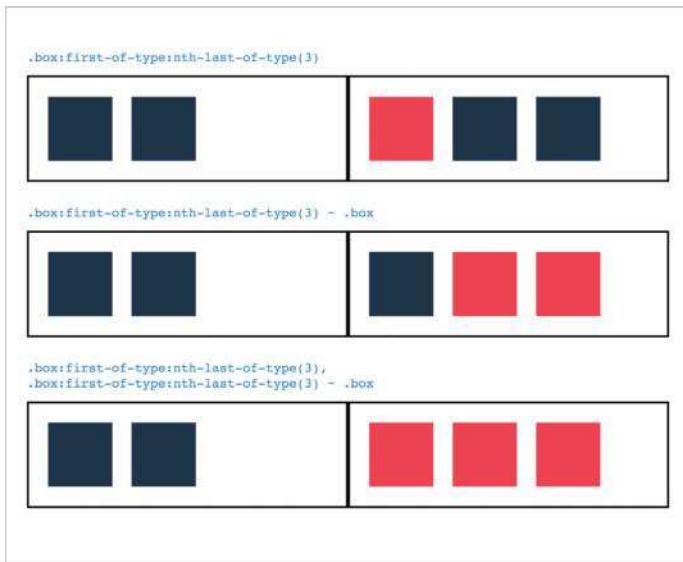
CREATE QUANTITY-SPECIFIC CSS STYLES AND LAYOUTS

Ahmed Abuelgasim explores how it's possible to change styles and alter layouts to make them more adaptive based on the quantity of elements using just pure CSS

In this tutorial we will take a look at ways of changing the CSS styles of elements, as well as seemingly styling their parents, depending on the number of elements. We will also see how to change the layout of elements based on their quantity, creating more adaptive layouts that make better use of space. Lastly we will cover the use of CSS counters to display an element's index within a set inside it, as well as displaying the total count inside the parent. All of this will be achieved with pure CSS only, without the need for JavaScript or frameworks, leading to simple and more efficient code.

SINGLE ELEMENT SELECTORS

CSS3 only has a single pair of selectors that can determine the quantity of elements, namely the `:only-child` and `:only-of-type` selectors. Having said this, they are really only able to determine whether an element is on its own or has siblings. The `:only-child` selector matches elements that are the only child of their parent, while `:only-of-type` matches elements that are the only ones of their type. Unfortunately, that's as far as single selectors go but there are a few other selectors that can target elements based on their order in a set of similar elements. These are `:nth-child`,



Above Selector `:first-of-type:nth-last-of-type(3)` and the general sibling combinator – can be combined to target the first of three and all its siblings, hence all in a set of three

“Combining these with other selectors allows us to build complex chains that target elements based on quantity”

`:nth-of-type`, `:nth-last-child` and `:nth-last-of-type`, which are typically used to target elements based on their order in a set of similar elements. The `:nth-last-child` and `:nth-last-of-type` selectors are used to determine the order of elements counting backwards from the last element to the first. Combining these with other selectors enables us to build more complex chains that target specific elements based on their quantity.

QUANTITY-SPECIFIC SELECTOR CHAINS

Of the four aforementioned selectors, the main one we will be using in this tutorial is `:nth-last-of-type`. The difference between this and the `:nth-last-child` selector is that the latter includes all the elements' siblings in the set, while the former only includes elements of the same HTML type and is therefore more selective. For the remainder of this tutorial we will use the `-of-type` selectors, however the `-child` variants are equally valid.

The `:nth-last-of-type` can be used along with the more popular `:first-of-type` selectors to create a chain that targets the first element in a set of a desired quantity. For example, we can use `:first-of-type:nth-last-` ►

CODING TRICKS

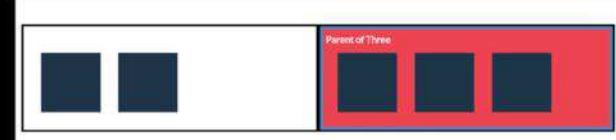
STYLE ELEMENTS BASED ON CHILD QUANTITY

Although we can't apply CSS styles to an element based on its number of children, we can cheat and use the first child's `::before` pseudo-element positioned to take up the full size of the parent, thereby appearing to change its style. This is achieved by giving the parent `position: relative` and the `::before` element `position: absolute` and `z-index: -1` to prevent it from overlaying the other elements.

Any CSS property that can be set on `::before` elements can therefore seemingly be applied to their parent, using any valid selector. We can hence target the `::before` element of an item that is first and also third from last, which only applies to a group of three, changing its appearance and even displaying text inside it using the `content` property.

```
.parent {
  position: relative;
}

.box:first-of-type:nth-last-of-type(3)::before {
  position: absolute;
  top: 0;
  right: 0;
  bottom: 0;
  left: 0;
  z-index: -1;
  border: 5px solid #1e90ff;
  background: #f03c4d;
  color: white;
  content: "Parent of Three";
}
```



Above Using a `::before` pseudo-element positioned to take up the full parent size, styles can supposedly be applied to the parent based on child quantity

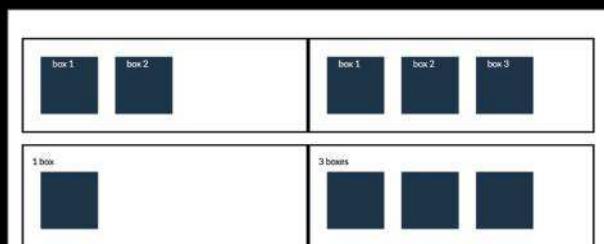
SEE ELEMENT QUANTITIES USING CSS COUNTERS

+ CSS counters can be used to determine the quantity of any set of elements that can be targeted with CSS. To use a counter, first initialise it in the parent using `counter-reset: boxes` where `boxes` can be any name you like. Then add `counter-increment: boxes` to the selector that matches the elements you want to count. For instance, we can show the element count concatenated with text in each element's `::after` pseudo-element:

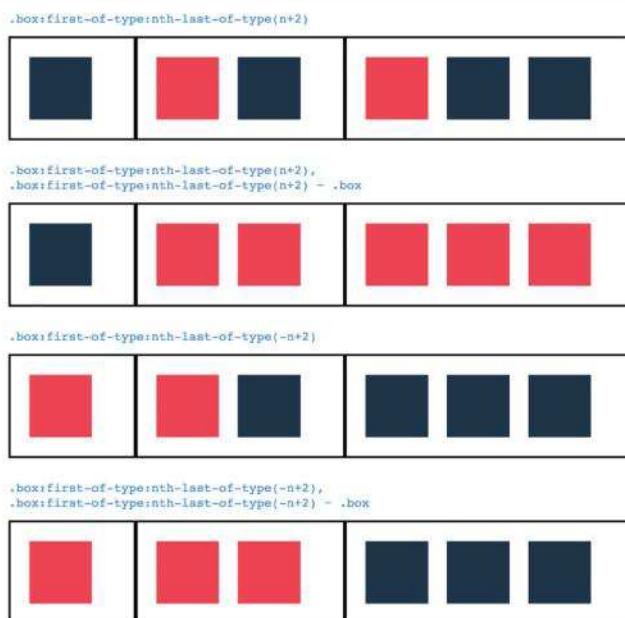
```
.parent { counter-reset: boxes; }
.box { counter-increment: boxes; }
.box::after { content: "box " counter(boxes); }
```

We can also show the total count in the parent using the `::after` element of the last child, positioned absolutely to appear inside the parent. To handle pluralisation we can show different messages based on element quantity by adding a singular case message to `:only-of-type::after`, and a plural case to `:nth-of-type(n+2):last-of-type::after`, which matches elements that are last and also second or higher in their set:

```
.parent {
  counter-reset: boxes;
  position: relative;
}
.box { counter-increment: boxes; }
.box::after {
  position: absolute;
  left: 0;
  top: 0;
}
.box:only-of-type::after { content: counter(boxes) " box"; }
.box:nth-of-type(n+2):last-of-type::after { content:
  counter(boxes) " boxes"; }
```



Quantity-specific text: The number of elements and quantity-specific text can be displayed in their parent using counters and pseudo-elements



Above Selectors `nth-last-of-type(n+2)` and `:nth-last-of-type(-n+2)` can be used to target elements in sets of more than and less than two respectively

► `of-type(3)` to target elements that are both the first and the third from the end of their type or, in other words, the first of a set of three. We can then extend this with the general sibling combinator `~` to select all siblings that follow the first of a set of three. Combining these two selector chains, we can create a complex selector that targets elements that are the first of three and all elements of the same type that follow it, thereby selecting all elements in a set of three.

```
.box:first-of-type:nth-last-of-type(3),
.box:first-of-type:nth-last-of-type(3) ~ .box
```

This selector chain not only works for a specific number of elements but can even be modified to target a range of quantities. If we want to target elements in a set with a quantity more than or less than a particular value m , we can use the chain with the `(n+m)` and `(-n+m)` techniques respectively. For instance, to target all elements in a set of two or more elements we can use:

```
.box:first-of-type:nth-last-of-type(n+2),
.box:first-of-type:nth-last-of-type(n+2) ~ .box
```

Similarly, we can target all elements in a set of two or less elements using:

```
.box:first-of-type:nth-last-of-type(-n+2),
.box:first-of-type:nth-last-of-type(-n+2) ~ .box
```

As you can see this is a powerful selector chain that enables us to achieve very interesting and useful things without the need for JavaScript or other frameworks. It is especially useful when it comes to creating adaptive layouts that change based on the number of elements.

DYNAMIC, QUANTITY-SPECIFIC LAYOUTS

Let's say we want to display a group of boxes that show the results of a search or an API call in a two-column, grid layout. The problem lies in the fact that the results come from an external source and we have no way of knowing the number of results that will be returned, therefore we don't know how many boxes will be created. While the grid looks great for an even number of boxes, when applied to an odd number the last box sits on a row alone and looks... well, kind of odd.

This is especially problematic when using flexbox items with flex-grow applied to them as it causes the last element to grow into the empty space on the row, thereby taking up the full width. One way

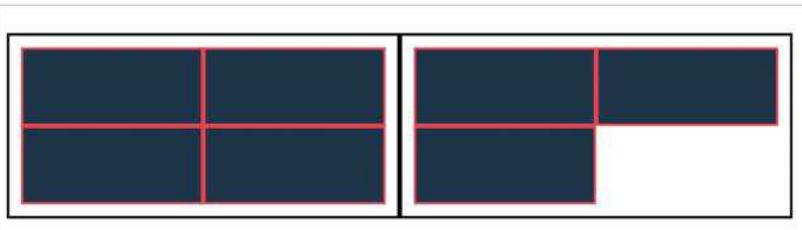
“These techniques offer a valuable way of creating dynamic, quantity-based styles and layouts”

of preventing this could be to make the first of an odd number of boxes take up a full row by applying a width of 100% to first boxes that are also an odd number of boxes from the end, using `:first-child:nth-last-of-type(odd)`. This provides a better layout as it gives the first and therefore most relevant or recent result more significance than the last one.

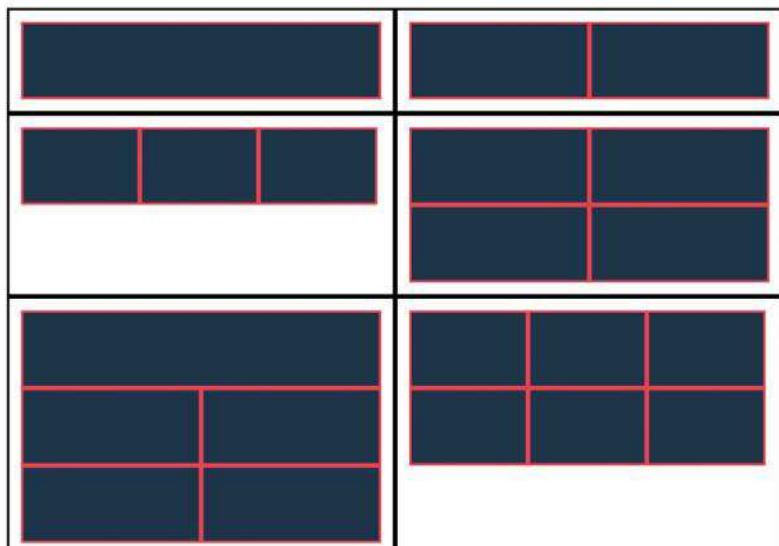
We can even add a special case for when the quantity is divisible by three using `:first-child :nth-last-of-type(3n)` to transform the grid into a three-column layout by applying a width of 33% to first boxes in a set with a quantity divisible by three and all boxes that follow it.

```
.box {
  width: 50%;
}

.box:first-child:nth-last-of-type(odd) {
  width: 100%;
}
```



Above Odd one out: for an even number of elements grid layouts look great, but not so much for odd numbers



Above Quantity-based layout: layouts can be changed based on the number of elements just by using CSS selector chains

```
.box:first-child:nth-last-of-type(3n),
.box:first-child:nth-last-of-type(3n) ~ .box {
  width: 33%;
}
```

CONCLUSION

As we have seen, CSS selectors can be chained together in a variety of interesting ways in order to apply styles and adaptive layouts that change based on the quantity of elements. The selector chains can also be used to seemingly apply styles to the parent of a set of elements of a certain quantity, by using `::before` or `::after` pseudo-elements that are positioned to take up the full size of the parent. Combined with CSS counters, these pseudo-elements can be used to display the total number of descendants in a parent element, as well as text that changes depending on the quantity of descendants.

These techniques offer a valuable way of creating dynamic, quantity-based styles and layouts that are useful when handling an unknown number of elements, which is often the case when dealing with APIs. ■

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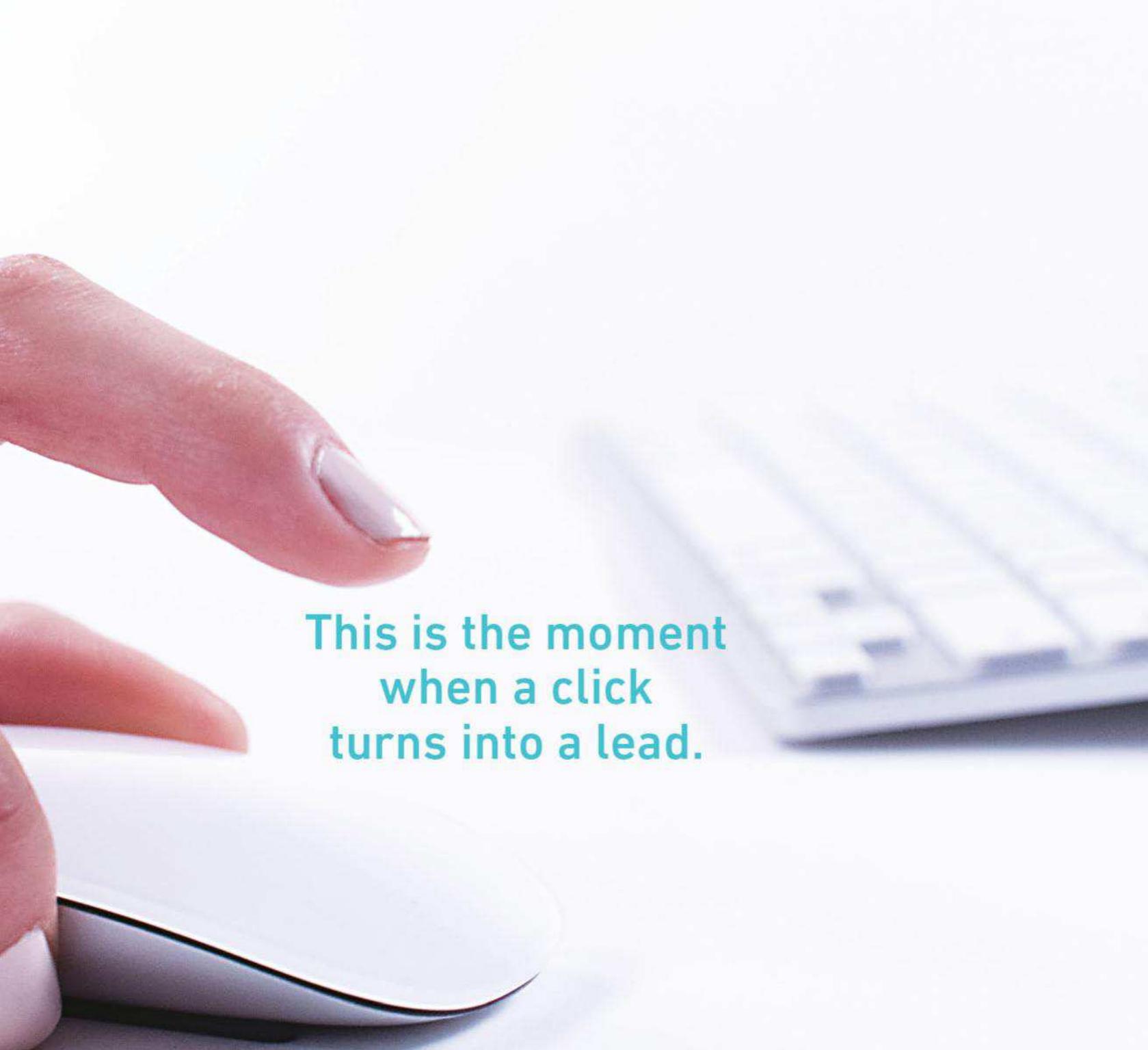
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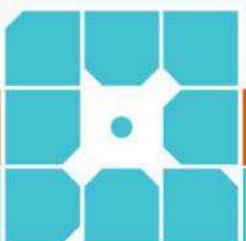
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