LOCALISE YOUR SITE DESIGNS

Jenny Shen reveals how you can design for different cultures

UTILISING UNITY

Deploy the game engine to make WebGL experiments

MASTER EMOTION

Use the CSS-in-JS library to swiftly style apps

The voice of **web design**

net

Issue 317 : April 2019 : *net.creativebloq.com*

★ JAVASCRIPT

CRACK CODE SPLITTING

Learn techniques for loading code only when it's needed

THE FUTURE OF MOBILE DESIGN

- Adapt content for a smaller space
- Build predictable navigation
- Break down roadblocks
- Create a consistent experience

TEST WITH USERLOOK

Gain direct insight into your users

+

SLIM DOWN YOUR IMAGE FILES

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FUTURE

ISSUE 317

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WELCOME

EDITOR'S NOTE

For anyone who might have missed the memo – not to mention a decade of chin-stroking think pieces – mobile is the future of web design. According to figures compiled by Statista, the statistics portal, the proportion of global web pages served on a mobile topped 50 per cent for the first time in 2017, rising to 52.2 per cent last year. Unless you want to miss out on more than half of the world's browsers, it's pretty clear mobile has to be a priority.

However, with the mobile web evolving at breakneck speed, it's not always easy to know where you should focus your efforts. Fortunately, we're on hand to help: Nick Babich has laid down the golden rules for future proofing your mobile site designs

And with greater disparities emerging between those on flagship handsets and budget bricks, eking out the best performance for all is becoming critical. To help give you the edge, Addy Osmani is here to show you how to split code and lazy-load JavaScript as and when it's needed.

But the great advice and insight doesn't stop there: I'm pleased to announce that Generate is back! Our biannual conference will bring the best names in web design to New York on the 24 - 25 April. So make sure you grab your tickets now (generateconf.com)!

Enjoy the issue!

FEATURED AUTHORS

NICK BABICH

Babich is a developer, tech enthusiast and UX lover and runs the blog UX Planet. On page 60, he lays out the steps you need to take to future proof your mobile sites.

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ADDY OSMANI

Osmani, an engineering manager working on Google Chrome, leads a team making the web fast. His guide to code splitting on page 68 will soon have you lazy loading JS like a pro.

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SUZIE MILLER

Miller is a solutions architect for Amazon UK and chair of the company's People with Disabilities employee affinity group. On page 87, she explores how working there has helped her embrace her differences.

w: *https://aws.amazon.com/*

RICHARD MATTKA

Mattka is an award-winning creative director, designer and developer specialising in VFX. He shows you how to wield Unity to create great WebGL experiences on page 76.

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EXCHANGE

Practical advice from industry experts

Send your questions to netmag@futurenet.com

THIS MONTH FEATURING...

LILLIAN AYLA ERSOY

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JON YABLONSKI

Yablonski is a product designer who's currently working on design systems at General Motors. He's also director of digital experiences for AIGA Detroit.

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t: @JonYablonski

★ QUESTION OF THE MONTH

In your article on agile development, you speak about the need to avoid discussions being dominated by extroverts. Do you have any tips for how to do so in practical terms?

Riya Goldsmith, Kentucky, US

LAE: I'm a huge fan of facilitated ideation discussion in conceptual phases or retrospectives where each person is first given time to write down their thoughts, then to share those thoughts with a partner or a group of three people. They then take turns and build further on their ideas, writing down whatever comes to mind, as well as prioritising their top three as a whole.

The groups can then present their ideas/results to the whole group for feedback or further exploration. This practice lets everyone contribute while carefully listening to each other. Another tip is encouraging a culture with creative sessions or hackathons, where people can choose to contribute individually or as a group. A great book for further reading on introversion is *Quiet* by Susan Cain.

Photo by Alex Kotliarskyi

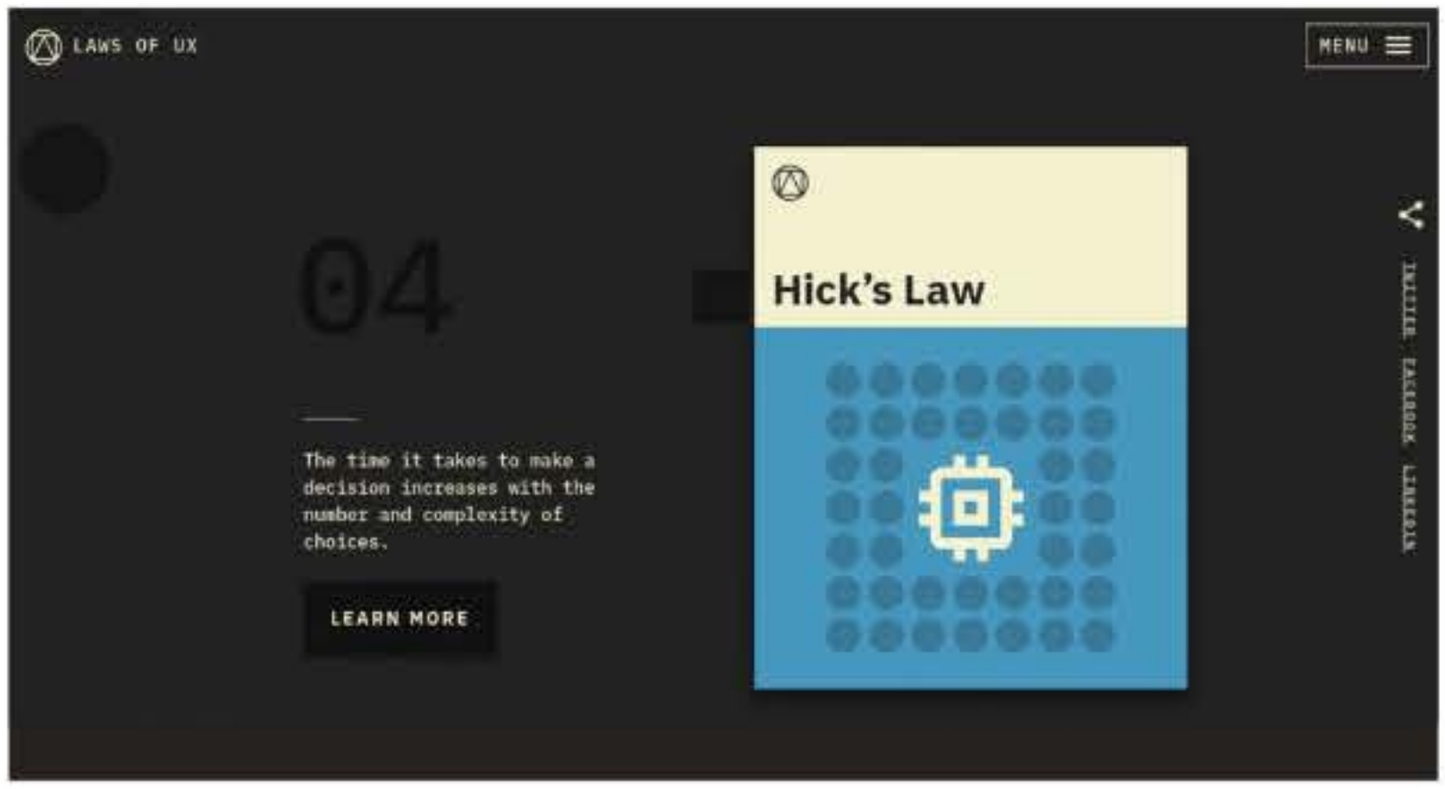
Hackathons are a good way to encourage a culture in which people can contribute individually or collectively

UX

ONE SIZE FITS ALL?

Jakob's Law – the fifth 'Law of UX' (lawsofux.com) on your site – says "users prefer your site to work the same way as all the other sites they already know". Does that mean there'll come a time when the design and functionality of most websites will be indistinguishable?

Teo Bull, Toronto, Canada



Yablonski's Laws of UX website is a collection of maxims and principles designers can consider when building user interfaces

JY: Jakob's Law of Internet User Experience describes how people form mental models of the way something should function based on their cumulative experience. It's a fundamental principle for how we learn and apply knowledge to new things. This means that breaking from a common design pattern or convention could end up confusing or even frustrating users who expect different behaviour. By designing around user expectations, we enable them to focus on their tasks rather than learning something new.

Jakob's Law doesn't necessarily promote ubiquity, though. It's often the case that entirely new functionality is introduced and spreads because it effectively aligns with users' mental models of how something should work. Take for example the pull to refresh pattern, which was incredibly successful because it aligned with the mental model that users already had: scrolling to the top of a feed for new content.

Process

ACHIEVING THE BEST

I'd love to know: what was your biggest learning experience in terms of process and team in 2018?

Bailey Stewart, Leeds, UK

LAE: My biggest learning experience of the last 12 months has been how vital it is to have time for meaningful and deep work together as an intimate and creative team, while pursuing quality and handcraft. Creativity is drowning and we need to encourage cultures that push each other further through inspiration, encouraging feedback, critique and several iterations. Further thoughts can be found in my article 'Why design thinking is failing and what we should be doing differently': *https://link.medium.com/ezjGKQh1cT*

UX

BEST OF BOTH WORLDS

The fourth law (Hick's Law) on your list seems to suggest narrowing users' choices while the 15th (Postel's Law) seems to suggests widening them. Is that right and if so how do you meet in the middle?

Diana Khan, Houston, US

JY: Both relate to user experience, although in different ways. Hick's Law, which states that the time it takes to make a decision increases with the number and complexity of choices, suggests that we can minimize cognitive load for users by managing the quantity and complexity of choice.

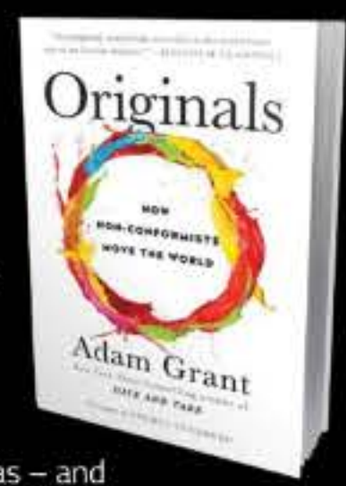
Postel's Law, which instructs that we should be liberal in what we accept and conservative in what we send, relates specifically to user input. An example of this would be an application that enables input via text or voice when using a search form (liberal input) but provides results in a well-defined format (conservative output).

3 SIMPLE STEPS

Can you recommend any books or blog posts about ideation, whether that's in the arena of web design or just to do with business generally?

Esha Trejo, Finland

Fight groupthink



LAE: *Originals: How Non-Conformists Move the World* by Adam Grant is one of my favourites and strongly recommended. It examines how people can champion new ideas – and how leaders can fight groupthink.

Diverge/converge

Design the Life You Love by Ayse Birsel is a lovely book showing the classic diverge / converge ideation methods you can adapt to your life as well as your projects. Really wonderful for self reflection on what is important for you and how it is that you see your life moving forward.

Stick to it

Made to Stick by Chip Heath and Dan Heath and *This is Service Design Thinking* by Marc Stickdorm and Jakob Schneider are also a couple of great reads packed with useful methods.

COOL STUFF WE LEARNED THIS MONTH

FACEBOOK IMPROVES UPLOADING IMAGES

Facebook's new tool, Spectrum, is an image processing library for Android and iOS that aims to improve the reliability of image uploads, while simultaneously making them less demanding on mobile phone data plans.

While the core of Spectrum is written in C++, Facebook has also released Java and Objective-C APIs.
https://netm.ag/2sWzhsU

GOOGLE TACKLES PLAY STORE SPAM REVIEWS

Google has created an anti-spam system powered by machine learning to get rid of fake reviews from its Play Store.

The company claims its new system was able to remove millions of false reviews in just one week.
https://netm.ag/2RXDgEy

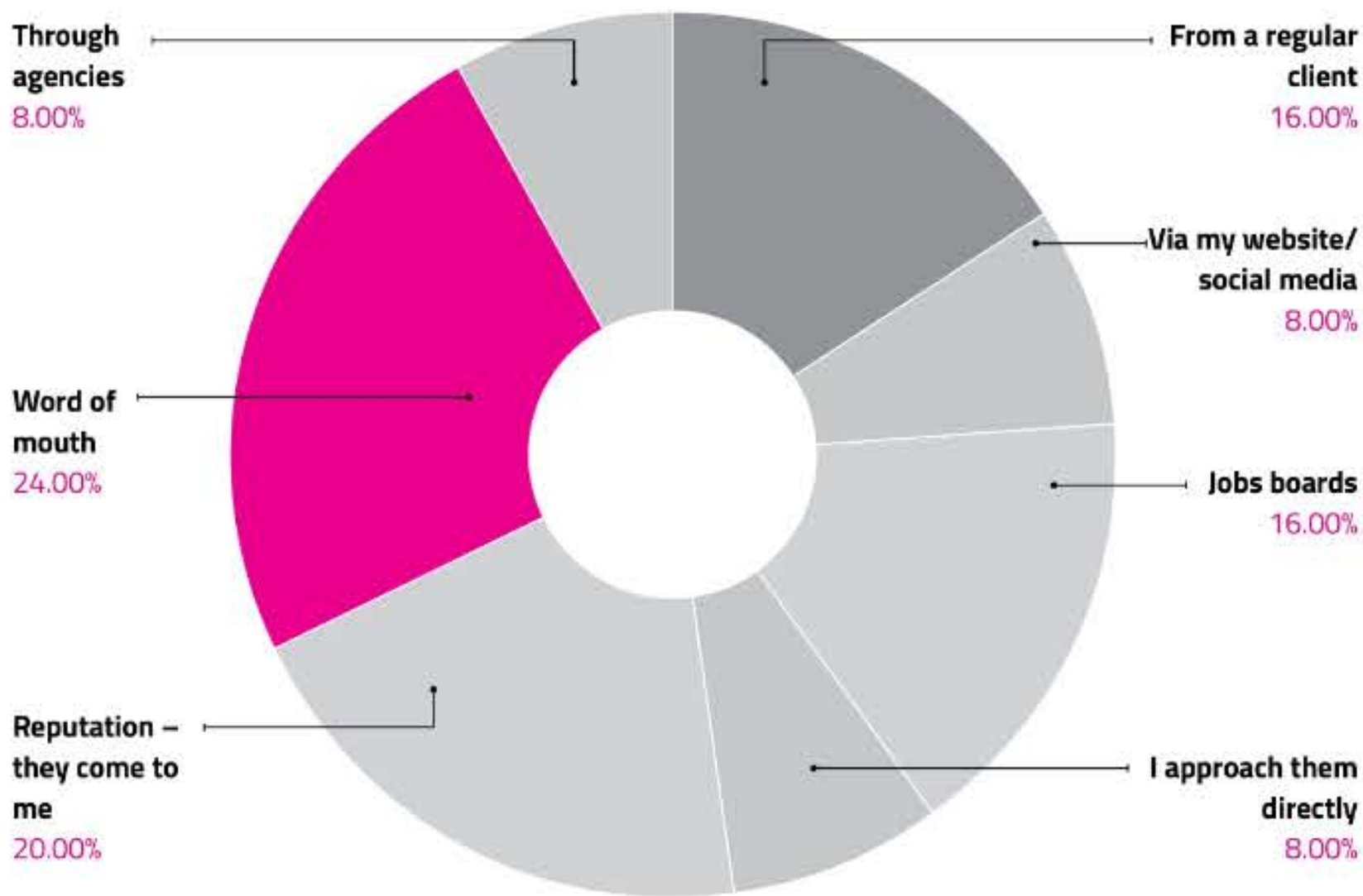
MICROSOFT AND KROGER JOIN FORCES

Microsoft and Kroger announced a collaboration to equip retail stores with Kroger Technology products that run on Microsoft Azure.

They say the technology utilises the Internet of Things, connectivity, the cloud and data collection and analysis to "improve both customer experiences and store bottom lines".
https://netm.ag/2SdAbQa

★THE POLL

HOW DO YOU FIND THE MAJORITY OF YOUR FREELANCE WORK?



From our timeline

What web development tech trends are you most excited about for 2019?

I really hope that HTML & CSS skills will be valued more highly alongside JavaScript too this year. I've seen many poor quality results because devs haven't understood them properly. And why would they if it's not a priority when hiring?
@muzzlehatch_

Automation. With advances in machine learning and connectivity, automation will be at the forefront of technology trends, with fintech making the most use of it!
@neilpearce

AMP pages, mobile first indexing and PWA
@SamBakesSalmon

More focus on #accessibility!
@web_instructor

More use of monochrome in web design
@YesIMaDesigner

If Apple adopts Android's approach for downloading PWAs to your device we could see a big exodus of 'native' and a big surge in inclusive development – native will always have its place, but for the 80% it could become unnecessary expenditure.
@wearethreebears

Definitely will see design systems become more prominent and progressive web apps become more popular.
@MattStenquist

GraphQL, Micro front-ends and CSS Modules
@olimpioadolfo

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THIS MONTH FEATURING...

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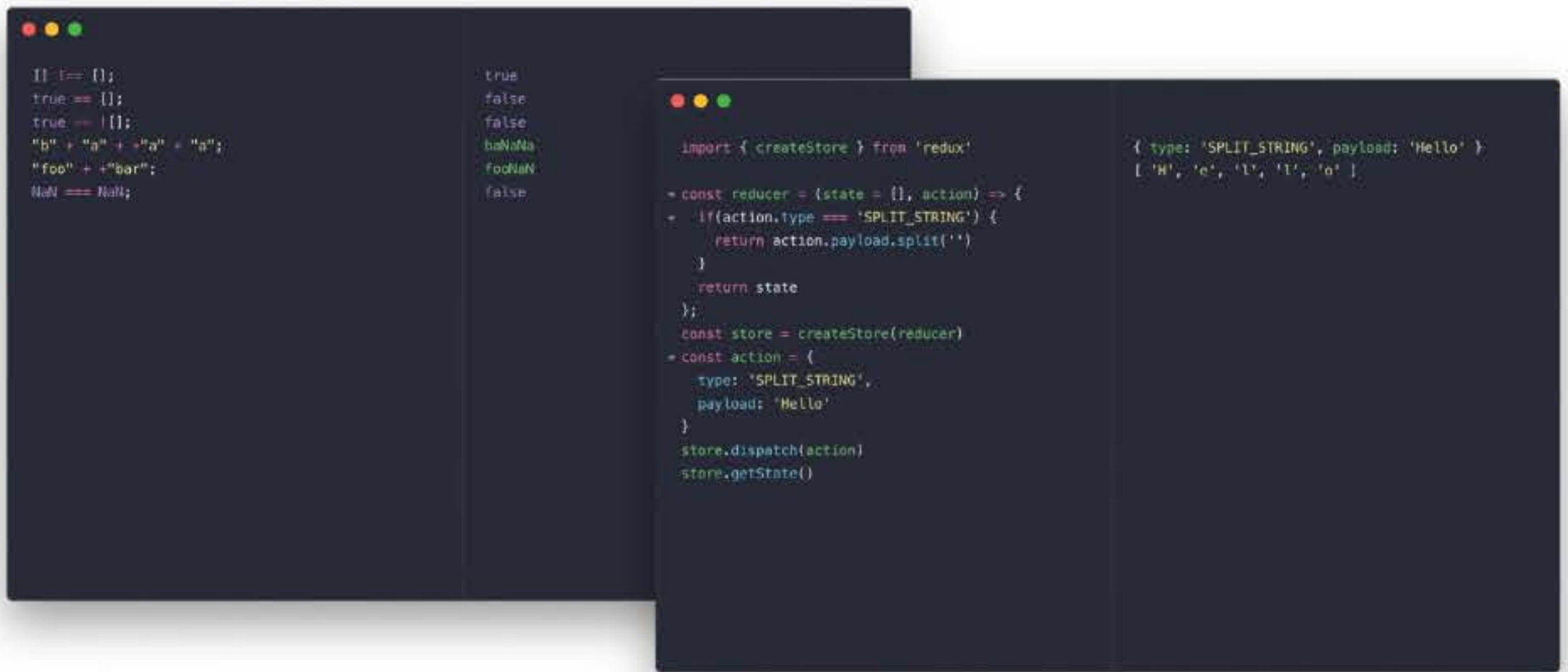
This month a web developer quibbles with a customer over why their site's SEO isn't showing

BEYOND PIXELS 15

Kate Kelly reveals how coding and crochet are really different expressions of the same thing

WORKSPACE 16

Louis Gillies on how coffee, collaboration and the coast make Propeller Devon's premier workspace



RUNJS

Luke Haas shares all on his JavaScript code editor

★ SIDE PROJECT OF THE MONTH

LUKE HAAS

job: JavaScript specialist and side project enthusiast

w: lukehaas.me

t: @lukehaas

Tell us what RunJS does.
It's a desktop application that acts as a scratchpad or playground for JavaScript. It evaluates code as it's typed and displays the resulting output line-by-line.

It includes Node and Browser APIs and supports modern JavaScript and TypeScript via Babel. It's particularly useful if you want to experiment with a bit of code without the hassle of setting up a project or if you want to try out an NPM package.

Why did you create it?
I wanted a standalone application I could use outside the context of a project with zero setup and that could handle modern JavaScript.

I also wanted something for when I just needed to play with a quick idea or see how a particular feature of a library worked. After searching for something that fulfilled this need and not finding it, I decided to build it myself. In the end it took me around five months of occasional weekend tinkering.

What were you hoping to achieve?
The initial idea came out of a personal desire but, as soon as I started developing it, I realised it could be something that other people found useful too.

The idea of RunJS as a learning tool is interesting to me and I think it has a lot of potential here. I think for new developers, being able to instantly see how JavaScript handles things is very powerful.

What technologies were used in building it?
It's built with Electron, which enabled me to develop it entirely with web technologies. For code editing and syntax highlighting I'm using CodeMirror, while Babel is handling code transpilation and for parsing I'm using Esprima.

I'm also using Spectron, which is a testing framework for Electron. With it, I've written a suite of integration tests to ensure the evaluated output RunJS gives is as accurate as possible.

How has it been received?
Its reception had been overwhelmingly positive. It has been featured in newsletters such as JS Weekly and been tweeted and shared more times than I can count. I've had a lot of positive comments and feature requests from lots of people in the JavaScript community, including from people who I really look up to like Kyle Simpson and Dan Abramov.

I've also had some great support from friends who helped me QA RunJS before I released it. One friend in particular was so into it, he was sending me bug report after bug report, none of which I could replicate. After a little investigation, it turned out he was still using a very early version of the application!

What do you think you'll do next with it?
I'd really like to expand RunJS as a learning tool and possibly introduce lessons and interactive exercises. Other suggestions I have received include having it render a user interface and to also prettify code.

*HOW TO

INSERT A VIDEO BACKGROUND

Using video as a page background has its advantages and disadvantages: the advantages are that it can look eye-catching, while the disadvantages are that it can slow a page considerably. Indeed, the response from most of our readers was along the lines of 'if you can avoid it, don't do it'. But what if that project you're working on calls for video? You're going to need to know the best way to go about it. If that's the case, here's some top advice from @netmag's followers.

SIZE MATTERS

Keeping things short is the cardinal rule when working with video backgrounds, according to @MichaelOglesby. He advises: "Keep the video short and in a loop. Optimise the video to get the smallest file size possible and make sure the video is the last asset to load."

BACK-UP PLAN

@MichaelOglesby adds that you should always be prepared just in case the video doesn't work, for whatever reason that might be. He says: "Have a background image backup, just in case it doesn't load."

LAZY LOAD

According to @frontendben, you should only use a video background when there is a real need for it, not just because it looks pretty.
He adds: "Optimise the video's size as much as possible and lazy load it in but only once the page has fully loaded."

SEO 404

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

*CLIENTS FROM HELL

I recently accepted a short-term job to modernise a website, optimise it for mobile and upgrade the SEO.

Client: I found the last couple of emails about what you were doing confusing. I can't find any SEO on the site.

I pulled up the site editor and showed her the hidden header text, the h1 tags, the hidden code for search engines, the Google analytics and also the spreadsheet I'd compiled of all the advertisements, social media campaign stuff and business listings I had updated.

Me: This is the majority of the changes. You can't see it on the site; you have to go into the page editor or open it in an editing program.

Client: So... What, do I have to pay you before you'll put it on the page?

Me: Uh... no. It's already published but it's not visible to your customers directly; it's only there where the search engines can see it.

At this point the client types the website address into the URL bar on their laptop.

Client: See look, it doesn't show up at all. How do my customers know I have SEO?

Me: SEO is short for search engine optimisation; it's not for people already visiting your website...

Client: Then why am I still on the second page!? I wanted to be on the top of the first page!

Me: You can't just get top results instantly, these changes will help over time. You can't buy yourself high rankings; you have to work hard on customer service. If you want to invest in it I could implement an ad campaign to that effect on Facebook, Instagram, Yahoo and so on.

The client snorted.

Client: Yeah, changes that cost more money. I get it now. I think we're done. I'll send your last cheque and will take my business elsewhere.

To their credit they did send that cheque. But what really keeps me up is wondering if they did hire a 'real professional' who could show them SEO on their site.

CLIENTS FROM HELL
clientsfromhell.net

CROCHET

Crochet is code: **Kate Kelly** reveals how coding and crochet are really different expressions of the same thing

* BEYOND PIXELS

You've been there: hours on end staring at your computer screen, the blue white light starting to bore into your brain. "I'll have a break for my eyes", you think. It's only later, when you get eye strain, that you realise your 'screen breaks' actually entail playing games or checking out social media. This was nailed home to me during a check-up at Specsavers when my optician advised me to schedule proper screen breaks or permanently damage my eyes.

Cut to crochet. A proper analogue, old-school craft. I was first introduced to it when I was a kid. My mum was an avid knitter and wanted to start me on something a bit simpler (she said). I enjoyed it but had forgotten all about it until the Specsavers incident. I went home to visit my mum and she furnished me with all the equipment (just a crochet hook and some yarn) and away I went.

For those not familiar with it, crochet is 'a handicraft in which yarn is made up into a textured fabric by means of a hooked needle'. It is repetitive and can be simple or complex. There are a number of different stitches that, when repeated and combined, can make a garment, object or toy. I hadn't really thought of it before but it's similar to code, which is a number of words, expressions or constants that can be repeated and linked together to make a website, programme or design.

Over the last few years my web design work has become less complex. My mostly third sector clients increasingly opt for cheap and quick, not bespoke. I find myself yearning for when I spent hours puzzling over why a bit of PHP wasn't working. The part of my brain that gets excited by that now gets a workout when I crochet.

I recently spent hours trying to adapt a pattern for a scarf to make it wider. I had to use quite complex maths to figure out the number of times a particular cluster of stitches repeated in a single row between the posts at each end. I got it wrong five times and had to unpick my work; it was way more complicated than coding. I eventually got it right and the scarf looked great. I wrote down the final pattern so I can make it again, thus creating a template for future use by me or anyone else.

So basically I now have crochet breaks during which I do some web design. n

* PROFILE

Kelly is a freelance copywriter, web and print designer in south Wales. She runs Black Cat Design. https://www.blackcatweb.com

STUFF I LIKE

NATALIE DE WEERD

Web developer
https://ndw.one
@nataliedeweerd

BUGHERD

Debugging can be frustrating without key information. BugHerd enables account managers to pin a site to flag an issue. The system takes a screenshot, logs screen size and browser, before adding it to a Kanban board. Then review and resolve!
https://bugherd.com/

ERIC MEYER'S CSS RESET

Every project I start includes a CSS Reset. I prefer complete control over how my elements will appear in each browser. It means I have to redefine unordered lists and reapply paragraph padding, but I'd prefer that to battling browser differences.
https://meyerweb.com/eric/tools/css/reset/

PEXELS

Pexels is just fantastic for finding high-quality, free-to-use stock images! Not only do these make great placeholder images when I'm prototyping a design but I've also used them in my own photomanipulations.
https://www.pexels.com/

PROPELLER

Louis Gillies tells us how coffee, collaboration and the coast make Propeller the ideal workspace for Devon's beach lovers

* WORKSPACE

Situated in a former courthouse in Exmouth, a stone's throw from the dramatic scenery of the World Heritage Jurassic Coast and the two-mile-long golden sand beach, is Propeller, a collaborative work space and community of makers, designers, engineers and people working on building businesses.

When it comes to location it's pretty hard to beat, especially for anyone who likes the water. Most of the community members enjoy water sports of one kind or another, from fast, adrenaline-packed kitesurfing to a more relaxed spot of lunchtime paddle boarding. And for those who prefer dry land there's always the beach or the beautiful commute from Exeter along the Avocet Line railway or cycle path [1].

Our focus is about building a community, so naturally we all picked up tools together to fit out the workspace after we took it on last year, a task made much easier when you have so many creatives and makers joining forces [2].

The old courthouse has an amazing vaulted ceiling with exposed rafters that give a great feeling of space and freedom. It has also been used to hang gym rings for some impromptu exercise, always a good way to cure any creative block while working around the large communal stand up table where we always seem to end up working on the next big shared project [3].

As well as growing collaborative ideas, another vital aspect of Propeller is to support and grow local talent. We hold events in our cafe area [4] to not only chat and socialise during our regular working routine but also to hold talks and informal discussions. These are open to the public and are a great way to share knowledge and inspire upcoming generations.

We encourage a diverse mix of people [5] from remote and home workers who enjoy the collaborative and social environment to makers prototyping ideas, experimenting and appreciating the crucial early feedback from peers. It's flexible and forward thinking, allowing us to compete with the more traditional economic centres and, at the same time, balancing our work and life without either having to give. n

* PROFILE

Gillies is a co-founder of Ordaloca and has been working from Propeller since it opened.

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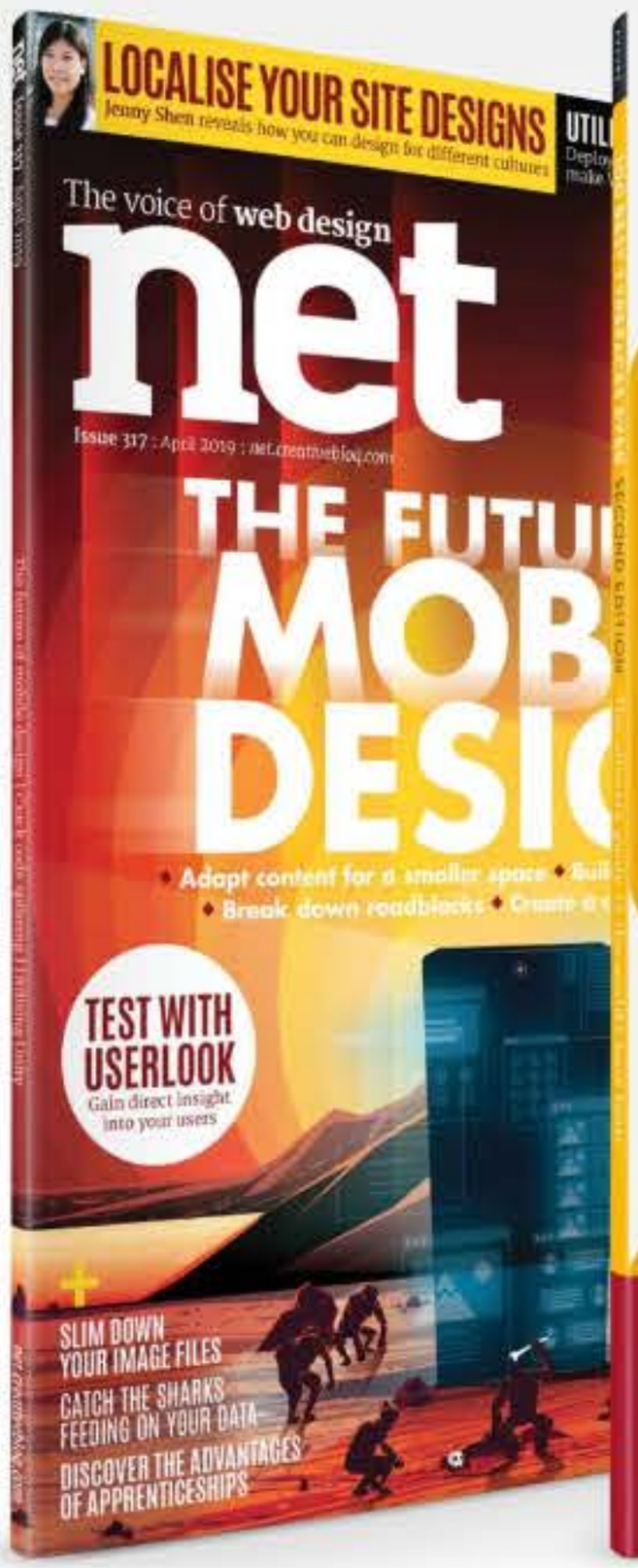

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★ BEHIND THE SCENES

BECOME AN APPRENTICE

Imaginaire Digital's **Charlie Worrall** explains what it's like to be an apprentice in the web design industry

The decision to become an apprentice was an easy one to make. I've never been a student that learns in a school environment; for me, getting hands-on was the way forward. While attending university would have been a fantastic experience, it wouldn't have been the smartest of moves.

Now that I've been in my apprenticeship for a while, I can say that it was most definitely the better choice for my personality and learning style. What's more, the fact that I've been able to get an apprenticeship in the field of web design means that I'm able to enter the digital industry instantly.

The point of an apprenticeship is to learn as you go with on-the-job training, which is brilliant. You're able to develop skills and learn processes that suit the way your company operates, which is ideal. And the fact they've invested time

and effort into your education offers the likely prospect of a job once you get to the end of the apprenticeship.

WHAT'S IT LIKE TO BE AN APPRENTICE?

Making it in the digital workplace is sometimes a difficult endeavour, especially for an apprentice. The main piece of advice that I'd give would be to ask questions. Don't feel afraid to ask a number of questions throughout the day because that's how you'll learn and that's why you're there.

One of the biggest problems with the apprentice world is that many employers see the opportunity to get cheap labour through the apprenticeship scheme. Luckily, for me that wasn't the case; my manager is constantly pushing me to take time out for learning and development. This makes a brilliant environment to work in, as an open workspace that invites innovation is always ideal.

Another side to this is that most of the members of staff in the office are going to be more experienced and know each other. For me, this meant that I was able to get to know everyone over time but, more importantly, I was able to take a look at how different people work through the same process. After that, I could 'borrow' certain aspects of what I had seen and form my own way of working that suits Imaginaire's ethos.

As mentioned before, the whole purpose of an apprenticeship is to learn as you go. But learning how to go through the web design process isn't a simple thing to do. Ensuring you know about the latest developments in trends, techniques and tools will always be one of the most effective ways to stay ahead of the curve. Subscribing to targeted news outlets, blogs and even tutorial channels on YouTube gave me a helping hand and they still do.

For some people, the most attractive part of an apprenticeship is the fact that they're going to be earning money while they learn. This is a brilliant aspect of the process: you have no student debts and you're able to look after yourself a little more. But the minimum wage for an apprentice is lower than that of a normal job. You have to remember that some people are going into that job with very little knowledge of the industry and need training from the ground up. So expecting to be earning the same as someone that's already qualified just doesn't make sense. Again, I feel very lucky that I've landed the job I've got at the company I work for. I was able to negotiate figures, which is always a key indicator that they're actually invested in your future and really want you to learn.

Being an apprentice in the web design and digital marketing world is fantastic if you're passionate about the work you'll be doing. If you're just looking for an easy way into the world of work, this most definitely isn't the way forward.

TAKING AIM

Having a plan is always a brilliant way to live your life. That's not to say that you can't deviate from the plan or make a last minute decision to change something. Having a 'loose plan' means that you'll be able to see how you can rise through the ranks or who you need to follow in order to learn more about the career you've chosen. For me, I'm hoping to continue my work at Imaginaire Digital and rise through the ranks to a managerial position. With that, I'd be able to take on more responsibility and continue to show my worth, challenge myself and push the boundaries of the digital marketing world.

While the aim for an apprentice is to become a full-time / real employee, I already feel as though I'm a 'proper' employee. I understand that I am an apprentice but I'm contributing to the workload and working with clients that are happy with the progress we're making. With that, I'm able to branch out into different sectors within the industry, from design and development to SEO. This means I'm able to get a sense of where I hope to progress and what I'd like to specialise in further down the line.

* PROFILE

Worrall is a digital marketing apprentice at Imaginaire Digital, aiming to rise through the ranks and maintain an innovative approach to marketing and web design.

★ WEBSITE SECURITY

USING RIPPLES TO CATCH SHARKS

Illustration by Kym Winters

'Digital sharks' are circling, preparing to silently strike websites and feed off your data. **Gav Winters** asks what if we could fend off attacks by monitoring site performance and watching for ripples?

Businesses today can no longer function without a web presence. That's good news for web developers and website designers. The bad news is that websites make businesses and their customers vulnerable to cyber attacks. The bigger the site, the more data it gathers. Data attracts digital sharks like chum.

Wikipedia lists the first major data breach as occurring in 2004 when AOL had 92 million records stolen. Each year the volume of breaches increases – 2016 recorded a 40 per cent increase on 2015 and 2017 a 35 per cent increase again. In total, there have been over 110,000 attacks on sites and those are just the ones we know about.

BLOOD IN THE WATER

The method of attack may vary but ultimately digital sharks feed on data and when customers enter their payment details online, that's like blood in the water.

Some breaches are difficult to notice and may occur multiple times to the same organisation. A business might patch their website against a known vulnerability, only to discover that data has already been extracted and sold online. In some cases, the site is put back to normal by stealthy attackers and everyone goes about their business none the wiser.

SALT IN THE WOUND

When an ecommerce site falls prey to cyber criminals and customers' emails, passwords, home address, payment card, date of birth, social security or login details are compromised, there is a cost to the organisation. In addition to the brand damage, the business risks losing customers and facing demands for financial compensation. The estimated average cost of a major data breach is over $3.62m. Now, under GDPR rules, businesses can also be fined up to €20m or four per cent of annual turnover, whichever is greatest.

FEEDING FRENZY

One of the more recent attack methods is to covertly hijack details entered into online payment forms, known as a Magecart attack. First seen in 2015, Magecart attacks have been carried out on a variety of big ecommerce sites including Ticketmaster, which unknowingly fed the digital sharks for nine months. In August, electronics retailer Newegg suffered a Magecart attack lasting more than four weeks. The same month, British Airways bled customers' payment card details for 16 days before detecting that its site had been hit.

The average time taken to detect a Magecart attack is currently 12 days. Thousands of customers' payment card details can be siphoned off during that time.

CATCHING A SHARK IN YOUR NET

At RapidSpike, our digital experience monitoring platform was designed to optimise the user experience by collating real-time and synthetic data on system performance and interactions. We show businesses how real users experience the website. As part of this monitoring service, ▶

- RapidSpike checks site performance every five minutes and alerts website owners to slow loading pages, bottlenecks or any unusual activity that could impact the user experience.

When digital sharks attack, they have to send data somewhere. The recent Magecart attacks have all had an associated server set up specifically to gather stolen data. We wanted to see whether our monitors would pick this up.

TESTING THE WATERS

Whether an attacker is hacking a third party in the website supply chain, formjacking a website or using some other technique for skimming data, the data must be sent somewhere.

Using this insight, our team got to work researching the problem in an effort to create a data breach monitor. During early research, one of our developers identified a significant security vulnerability with a seemingly innocuous app run by City of York Council. The One Planet York app was sending the personal details of its users to other users of the app, whenever the 'Leaderboard' page was selected.

This kind of issue isn't what data breach monitoring is about. City of York Council left the swim cage wide open: a digital shark would have devoured everything inside! We immediately informed the council of the app vulnerability. Following the due process for responsibly reporting vulnerabilities, we let City of York Council know before any true breaches occurred.

STUDYING THE PREDATORS

During our testing period, news broke that Vision Direct was the next Magecart victim, losing 6,600 customers' financial details in the six days before the attack was detected. We set to work studying the predators' tactics.

In our internal testing, we observed that Magecart type attacks used different methods – whether it was embedding code in internal JavaScript or using Google Tag Manager to insert a new analytics skimmer. However, the one common factor was that all Magecart attacks send data, every time. Using this key insight, we were able to design our data breach monitor.

The malicious JavaScript file that was injected into the Vision Direct website was still live at 'g-analytics.com'. As is common with these attacks, the domain name and file looked similar to a legitimate plugin; in this case 'g-analytics' could easily be mistaken for Google Analytics. After analysing the code contained in the file, we were able to create a fake payment form that was susceptible to the same skimming attack. We loaded the file live from 'g-analytics.com' to ensure a fair test. As we filled out our fake payment form all the data presented in the payment form was sent to the attackers. Around five minutes later we received a notification from our data breach monitor: data was being sent to an untrusted host. Success!

RIPPLES IN THE WATER

If you are using third-party extensions for marketing, analytics, reviews or comments, you have no control over their security. Supply chain attacks are incredibly hard to prevent and the more third-party suppliers an ecommerce site relies on, the greater risk there is of it being attacked.

From major airlines to contact lens suppliers, cyber attacks are targeted, sophisticated and becoming more frequent and sustained. The criminals responsible for these attacks are adept and coordinated predators who are able to swiftly target any vulnerability. All that responsible business owners can do is to take measures to try and contain the problem.

> "Whether an attacker is hacking a third party in the website supply chain, formjacking a website or using some other technique, the data must be sent somewhere"

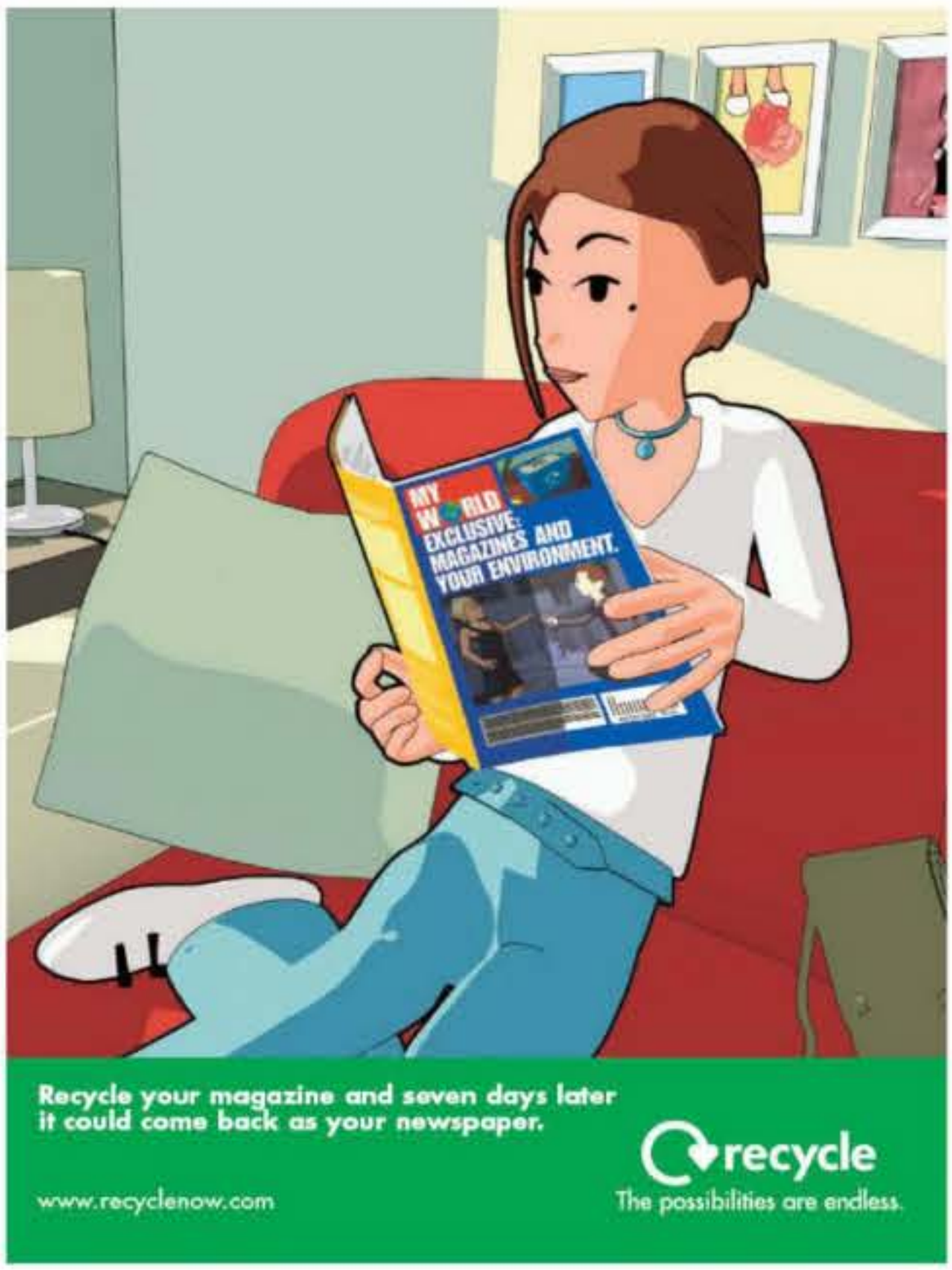
The good news is that, although the attackers are stealthy, they leave ripples in the water as data is siphoned off. We have now tested our data breach monitor against many of the biggest attacks and have discovered them all in a matter of minutes.

At RapidSpike, we're confident that, although we cannot stop an attack, we can provide a way to detect it as quickly as possible. Reducing the time taken to stem data loss from 12 days to five minutes enables organisations to intervene to protect customers' information before catastrophic financial and reputational injuries are sustained.

One thing is for sure, the digital sharks are always circling: we need a bigger boat, a stronger cage and the right processes in place to ensure that if we are attacked it's not life-threatening. n

* PROFILE

Gav Winter is the CEO of monitoring platform company, RapidSpike and founder of software testing company, The Test People.
t: @jedi_tester



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TWO SIDES

Jenny Shen

Words by Oliver Lindberg

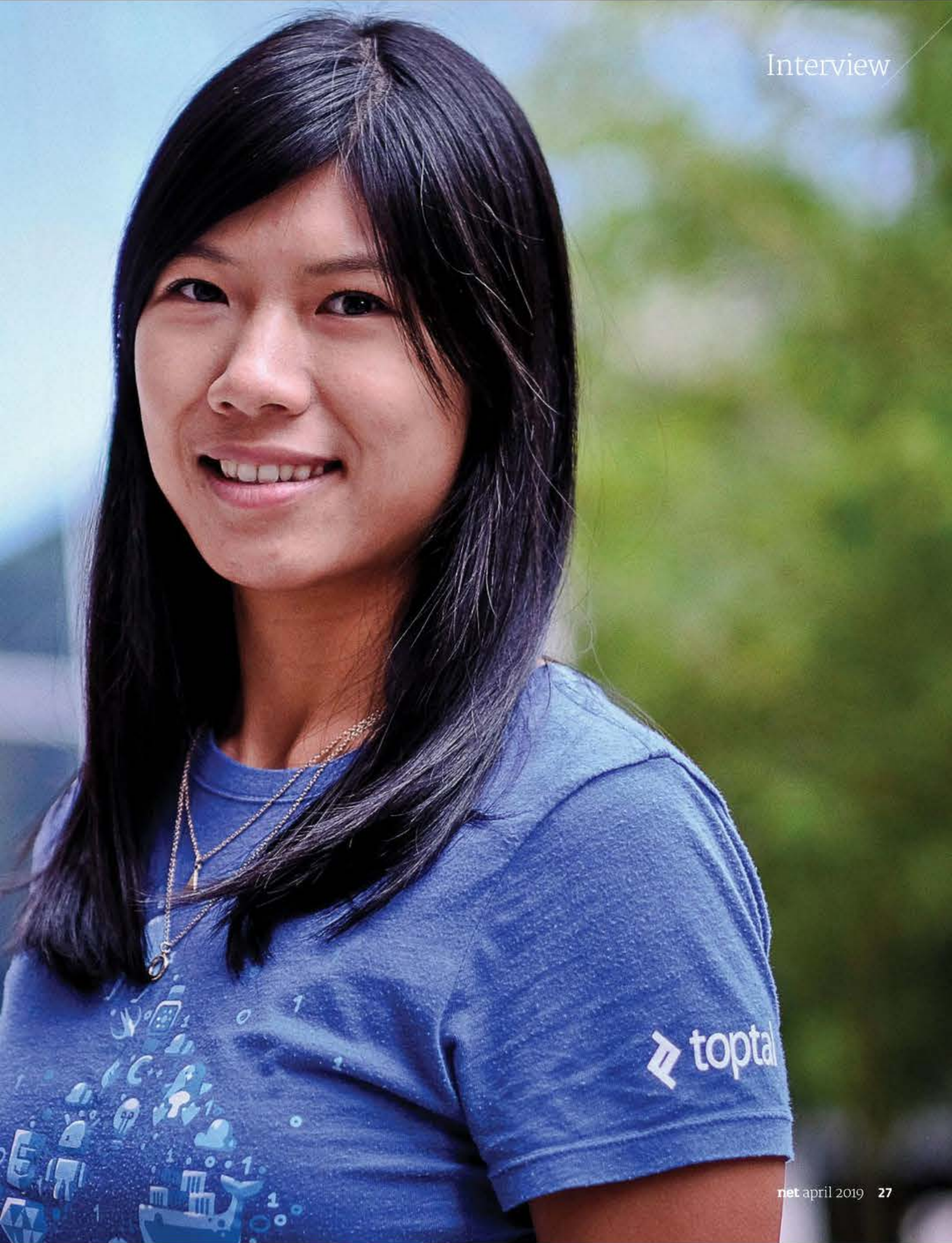
Independent UX and product designer **Jenny Shen** explains why and how to design for users across different cultures and reveals the – often surprising – cultural nuances that can make or break a product

INFO

job: Independent designer and strategist

w: *jennyshen.com*

t: @jennyshen


toptal

Translating a digital product into different languages is no longer enough to expand into new markets these days. To really reach and resonate with international users, companies need to be aware of cultural differences and ensure they adapt their products accordingly. This is where Jenny Shen, a UX consultant who specialises in cross-cultural design and localisation, comes in.

The business value of localisation is immense: according to the Localization Industry Standards Association, the potential return on investment is $25 for every dollar spent.

"Only 4.8 per cent of the world's population are native English speakers," Shen points out. "Most of the customers who can't read English won't buy from an English website. By localising, brands [not only] gain a competitive advantage [but] increase sales in global markets and broaden their brand awareness. Local users, meanwhile, feel more connected as the product is more aligned with their behaviour, values and way of living. It's just as important as personalisation."

When used appropriately and strategically, cross-cultural design helps to improve and optimise the user experience for local users, which increases their loyalty to a particular product. Before starting the localisation process, however, Shen advises that designers conduct extensive research.

"Companies must first understand the market, especially in their industry," she recommends. "Who are the local and international competitors? What are the channels that they can sell their products through? They must validate that the product can work in the market – it's just like validating a new product concept – and that there is demand. If they don't do this research, they could enter a really competitive market. There might already be a really strong player that's impossible to beat. Look at China and ride-hailing app DiDi, for example. Uber had to exit the market."

Photo: Mario Taferner at concat()

Localisation research, which Shen suggests should be done in the local language as much as possible, also includes analysing ecommerce reports and white papers, as well as academic research. It's important to be aware of the market's official languages, local holidays and sales periods. Once companies have decided they want to localise and researched the market they want to break into, Shen advises they conduct both quantitative and qualitative user research and interview real local users, which may reveal nuances that could improve their UX. Understanding users' behaviour – such as how they shop and pay, what kind of devices they use and what the internet speed is like – is essential before developing the product. As an example, another ride-hailing app, Grab, launched an on-demand motorbike service because that's the way local people commute in south-east Asia.

Shen is passionate about immersing herself in different cultures. She finds that travelling and living like a local is the best way to conduct ethnographic research and learn about and experience local culture. Shen herself grew up in Taiwan. When she was 12 her family moved to Canada and she started learning about cultural differences. She wanted to see more of the world so in 2013 she moved to Singapore and now lives in Amsterdam. In total, she has visited 52 countries, lived in six and has worked with users from 27. Many of her clients are in different time zones. Remote work enables her to focus and be more flexible. It also means she can explore other cultures and engage with local users.

In some Asian countries, for example, Shen discovered that users like to have more information up front. "In collectivistic societies, other people's opinions matter," she explains. "People tend to follow trends and prefer to read what others are reading. They also want to find out more about a company and absorb all the news before they make a decision, whereas in individualistic societies, such as the US, Canada or Europe, people tend to want to have control over what they read and search for. This cultural difference can affect

Photo: Simon Trel at Figma x LTUX Amsterdam

Photo: Niels Luigjes at Laracon EU

landing pages, trust and the UX/UI of a product," she advises.

In her article, *Cross-Cultural Design and the Role of UX* (*www.toptal.com/designers/business-website-design/cross-cultural-design*), Shen describes how Mozilla referenced cultural psyches when they created localised landing pages for Firefox. The Chinese page had a lot of content – banners, news and ads – that filled all available space, whereas the American page followed a very minimalist and clean design with just one clear call-to-action – to download the browser.

The language itself also has a big effect on how information is presented. Shen is a native Mandarin speaker and explains that the word 'dao' can have hundreds of different meanings (for example, a religion, principle or even road). So it takes Asian users a lot longer to type in a word than English-speakers because they have to find the precise word and decide on the meaning of every single character. "As a result, voice inputs are a lot more common in Korean or Taiwanese products," Shen points out. "The older generation especially, like my parents, hates typing. They prefer handwriting, recording their voice or using voice-to-text translations."

When Shen designed a service for Japan, another culture that needs a lot of information up front and expects precision, she discovered that users like to look at rankings. On ecommerce sites top 10 lists for each category are common to help customers discover popular items.

> "Design patterns that are universally used in western countries simply don't work in other cultures"

German users, meanwhile, really value attention to detail and like to read comprehensive information. In fact, according to a report from the Simon Fraser University, paragraphs are almost twice as long in Germany as in the US. "We tested if this was true with one of my clients who was localising for Germany," Shen remembers. "They offered workplace rental and on their site we experimented with doubling the copy to describe the workspace. We gave users a lot more information and it increased conversions!"

As German users feel less comfortable with ambiguity and need more assurance in order to make a buying decision online, it's also common in Germany to display ratings, reviews and trust badges. They help customers evaluate a website's or app's credibility and feel more confident in the experience. It's unique to the German market and culturally different from even neighbouring countries like the Netherlands.

Other design patterns that are universally used in western countries simply don't work in other cultures. The hotly-debated hamburger menu, for example, isn't the norm in China, where it could confuse users. Instead apps use a 'discover' button that typically features a compass icon that, when clicked or tapped, reveals more information. "The hamburger menu doesn't actually translate into meaning in Chinese culture," Shen warns. "The three dots can mean a lot of things to a lot of people and it's much more intuitive to discover content. Saying that, in other parts of ►

Photo: Niels Luigjes at Laracon EU

Photo: WeShootAmsterdam

Asia, they do use the hamburger menu because some markets want to appear more western and international. So, to really understand the UI patterns of a market, a design team should conduct a competitor and local product analysis."

Last year Shen gave 18 talks, mostly about designing for users across cultures – an amazing achievement, especially considering she only got her first big speaking gig in 2017. It came through a recommendation from the Europe community lead at Toptal, a freelancing platform Shen is a member of. A Bulgarian conference was looking for a presenter and Shen ended up making her debut in front of 1,000 people.

For 2019, Shen has decided to slow down and just give one conference talk per quarter. She's planning to teach and run more design sprints and workshops. She is also passionate about the community and volunteers as the regional director of EMEA at Ladies that UX. She founded the Amsterdam chapter and has helped grow it to more than 2,500 members.

Another way Shen helps junior designers grow in skills and confidence is through mentorships. She gives career advice, reviews portfolios, advises on how to approach design exercises, master job interviews and more. "I found having a more senior person I can go to for advice or even just shadow and see what their work is like is super valuable," Shen says. "That kind of experience is not something you can really google or read articles about." But two years ago she identified that a lot of people were having a hard time finding a mentor. Some were designers that were getting started with their UX career, while others had no seniors to turn to because they worked at a small startup. And this is something Shen could relate to. "I didn't have a mentor myself," she recalls. "I know how challenging it can be and how easy it is to doubt your own work."

Shen set up her own programme and to her surprise a lot of people signed up. Since 2017, she has mentored more than 20 people from around the world, including the US, Canada, Australia, India and Taiwan. She describes her role as a sounding board for her mentees so they can discuss troubles and receive actionable advice. "I share some of my work process, explain how you talk to stakeholders and communicate your design and your decisions," she says. "The mentees then talk me through personal problems they're experiencing in their work and ask me how they can solve them."

Usually, these mentorships last around four months but Shen has also mentored a designer for almost a year – all the way from graduating at General Assembly through her first freelance client to landing a full-time job. The most mentees she's previously taken on was six but she's now limited it to two so she can dedicate enough time to each one and fit them around the many projects she juggles.

To further her own development, share knowledge and exchange notes with peers, Shen has just joined a mastermind group with other internationalisation strategists. She's also working on a guide to help companies get started in localisation. "The one-size-fits-all approach just doesn't work anymore," Shen advises. "Users don't want to have to adapt to a foreign company's approach and get used to their layout, text direction or language. Identifying cultural differences and meeting local users' needs is vital to a product's success in another market."

"The one-size-fits-all approach just doesn't work anymore. Users don't want to have to adapt to a foreign company's approach"

Photo: Mario Taferner

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Q&A

BETH DEAN

Beth Dean on managing the teams that stop bad things happening with ads at Facebook

INFO

job: Product design manager at Facebook

w: *thebethdean.com*

t: @bethdean

Could you briefly introduce yourself to anyone who doesn't know you?
My name is Beth Dean and I'm a product design manager at Facebook. The teams I support work on keeping people safe and keeping our ads transparent.

My career path has taken some unexpected turns. I've been everything from a front-end developer to a UX researcher. I've worked at giant companies and tiny startups. I've worked in a lot of different industries, like news, travel and insurance. In another life, I was a professional comic book illustrator. I'm always surprised how relevant those experiences are to my work today.

What are the biggest challenges you're facing in your role at Facebook and how are you responding to them?
My biggest challenge is scale. First, we have a lot more employees than when we started and many are working on safety issues. I invest a lot of time in keeping teams connected who work on similar things. This helps us create stronger products.

Second, when it comes to issues of safety, there's no 'one size fits all' solution. What works well for one country isn't enough for every country. This means our job is never done and there will always be more research and iterating to do. I've learned so much in this role and I still feel like I have so much more to learn. I'm humbled every day and having that responsibility is a privilege.

It says on your LinkedIn (*https://www.linkedin.com/in/bethdean*), 'I'm hiring'. What kind of people are you looking for?
I look for designers who are strong in two dimensions. First, do they have solid execution in visual design, interaction design and product thinking? Second, how well do they collaborate and communicate? We're a company built on collaboration. Mastering your craft is only one part of being a strong designer. Similarly, product design is only one role in a strong design team. We can't do our work without our content strategy and UX research partners. We also partner closely with our engineer and product peers to design together.

You're doing some talks this year. What will you be speaking about?
I'm speaking at An Event Apart in Seattle and Denver this year. My talk is about building systems that are more aware of their external environments. There are a lot of books coming out about how products can respect individuals. We don't have a lot of precedent in designing for externalities.

While digital product design is a new discipline, designing safety at scale is not. We have many successful models in healthcare design, aviation safety and urban planning. I talk about how designers can incorporate those models into our work. The lessons apply whether you're designing for 200 people or 2 billion.

In general, what's exciting you most in the field of web design right now?
We're in a unique time where digital design has become part of our day-to-day lives. Expectations for our work are different and the stakes are greater than they've ever been. There's much conversation about why we build the things we do and what the consequences are. It's exciting that designers are thinking beyond the boundaries of a single app. Our industry is doing much self-reflection on how our work affects people's lives. We're going to learn a lot about technology and well-being in the next decade. I'm excited to see how that changes our discipline and shapes our work.

Read more about Dean's work at https://medium.com/@bethdean. *You can see her speak at An Event Apart in Seattle (4 - 6 March) and Denver (28 - 30 October).*

* INDUSTRY INSIGHT

WHAT DO YOU ENJOY MOST ABOUT YOUR JOB?

Seven web design industry gurus reveal to us exactly what it is about their work that puts a smile on their faces

DANA JAMES MWANGI
Branding and web strategist and founder
www.cheerscreative.com

I love taking someone's story and making it come alive on the web. Through that storytelling, I get to make this digital space that consumes so much of our lives feel more human. I love the never-ending hunt for blog articles, books and software that keep me up-to-date with what's coming next. I love that I get to make something that lives – and by 'lives' I mean it works. I can make a website – something that's intangible – work and make real, measurable change for a client. That's a superpower.

INAYAILI DE LEON
Senior designer, Microsoft
yaili.com

That I can do it from anywhere in the world with a good internet connection. I don't think about this much when I'm actually working but it's something I feel very grateful for. I love the flexibility – it's handy to be able to be home when a parcel is coming – but mostly it gives me peace of mind to think that if something bad or annoying were to happen – like Brexit or a snowfall – I wouldn't have to be in a certain location to be able to work and make a living.

JOHN CLIFFORD
Owner, Think Studio
thinkstudionyc.com

Learning. Web design is always changing. There are always new things to learn: new ways your user can interact, new software and new devices. I also like learning about psychology. As designers, we need to understand why our users act the way they do. Once we do, we can create experiences that are more engaging and usable.

I also teach web and interactive design. So I not only need to focus on my client work but on the big picture for my students. I need to keep up with each development so I know what I'm talking about. I'm not preparing them to design for the present day but for the future. And I hope to instil a love of life-long learning in them as well.

JAMES STUMP
UI designer, This Place
thisplace.com

My favourite thing about working in web design is learning about different industries. To design a website you have to understand the industry and people you're designing for, which can be an interesting and rewarding challenge by itself.

There are a number of ways you can do this but, for me, nothing beats being able to talk to industry experts and current or potential users. You can't become an expert overnight, so speaking to those who are can give you valuable insights to help drive the early stage of design.

JORDAN MOORE
Product designer
www.dawsonandrews.com

The thing I enjoy most about my job is taking on a difficult problem – the more unreasonably difficult the better. The apprehensive feeling in your gut when faced with that kind of problem is a good indicator of new opportunities to learn things, solve difficult problems and develop new capabilities. By default, high-stakes problems will push you into new territory beyond your comfort zone and therefore the unavoidable side effect is personal growth. And yet how many times have you or your company turned down a project because it was beyond your capabilities?

DAVE BOWERS
Head of strategy, Likely Story
www.likelystory.agency

The great thing about working as a web designer is the weird mashing of art and science. In fact, this must be one of the only professions that draws on both aspects in such great dollops. On a typical web design project, you can identify a problem with raw data, solve it with creativity and intuition, then look back on a job well done afterwards with metrics! Even if what you create doesn't turn out quite as you'd planned, you can continue mini-rounds of rational-creative-rational until it does. It's a challenge, of course, but an enjoyable one overall.

EDITH ALLISON
Freelance developer
agentur-allison.at

I love solving problems for my clients. When a client tells me 'we've got this issue', that's when things get exciting. Taking a problem and turning it into an application is a joy when a client takes the time to discuss the project and test potential solutions. A website developed as a collaboration between the client and myself works much better than when I'm expected to just do my thing. Direct client contact, a mixture of business types and interesting problems keep me motivated.

RESOURCES

10 REASONS TO BE HAPPY YOU'RE A DESIGNER

https://netm.ag/2Fu8Tz5

The humdrum of daily deadlines can make it easy to forget why you decided to be a designer in the first place. In this article, Sam Hampton-Smith reminds you of 10 reasons you should be happy to be a designer.

THE JOY OF DESIGNING FOR HAPPY COMPANIES

https://netm.ag/2FAbiY8

In this talk from Generate New York, Meg Lewis shares some tips for designing personable products that she's picked up through her career designing for happy companies and even happier users.

8 TIPS FOR COPING WHEN YOU HATE YOUR JOB

https://netm.ag/2RNGxFP

We have all had jobs we hated. But you have a secret weapon: your creative design skills can get you out of this situation. In this article for Creative Bloq, Karl Hodge offers eight tips that'll get you started.

DESIGN ETHICS

ETHICS AS A NEW DESIGN PHILOSOPHY

Data design philosophy has extensive societal impact. **Romain Demongeot** says: let's ensure it's ethical

The data misuse scandals of 2018 gave us 'Techlash'. What was once the concern of a few privacy advocates has broadened into a much wider array of voices driving debate around digital design philosophy and ethics.

In our new era of 'surveillance capitalism', data can be a scary thing. The increasing presence, complexity and autonomy of algorithms and bots create many moral challenges. The onus should be on both designers and data scientists to be accountable and respectful towards people's data, while preventing abuse. And yet many in the field feel privacy is not their concern.

Apple, however, is taking strides in the right direction. Late in 2018, the company purchased a little known AI outfit called Silk Labs (*https://netm.ag/2WyZVWy*). Silk Labs creates AI software that's light enough to fit onto consumer hardware like cameras, meaning Apple's interests in AI can be achieved without the cloud.

Although this may sound like a nerdy granular detail, it could have wide-reaching positive societal significance. With other tech players aiming for a slice of the mighty AI pie through leaky cloud-based systems, they are endangering people's privacy. But Silk Labs, by circumventing the cloud, gives Apple a privacy-centric way of driving AI and suggests that the company is shifting its design philosophy to address the growing public alarm over personal data, a stance confirmed by the brand's huge privacy ad at CES (*https://netm.ag/2MLG6XB*).

Where Apple treads, others follow. So there is reason to be optimistic that this heralds a new era of ethically driven design philosophy. In fact, further hope can be found in German social networks such as XING, which stands against US competitors by having zero tolerance when it comes to slack privacy and data security measures. Users' data is stored on German servers and the platform adheres to the country's strict data laws.

The need for ethically driven design stretches beyond the collection and use of personal data. The algorithms that increasingly shape our daily lives are similarly affected by the type of data we collect. As Cathy O'Neil writes in her book, *Weapons of Math Destruction*: "When we blithely train algorithms on historical data, to a large extent we are setting ourselves up to merely repeat the past. If we want to get beyond that, we'll need to do more, which means examining the bias embedded in the data. The data is, after all, a reflection of our imperfect culture."

Because of data's far-reaching tentacles, in addition to following closed data paths and developing designs that avoid the cloud, we need companies operating in the data economy to create new roles where people take responsibility for data ethics.

Although the subject of data design may feel a bit geeky, it has significant cultural ramifications. For proof, look no further than the way social platforms were designed. The 'dislike' button is at the core of social platform design and has become a breeding ground for the bacteria of hate. The effects of this fundamental design flaw are being experienced in everything from the personal through to the political.

With a leader like Apple taking positive steps, there is reason to be optimistic that data design philosophy will embrace ethics. And not just in the tech sector: the food industry, for example, is looking into how data design can boost provenance through traceability. So perhaps the first companies responsible for exposing the deep-rooted societal consequences of poor data design will be the same companies that trigger a change for the better?

PROFILE
Demongeot is new business creative director at UNIT9: a global technology innovation company working with companies like BBC, Huawei and Nike.

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GALLERY

Sensational design and superb development

MARK BILLEN

Billen is a freelance writer who has been writing about web design and technology for over 15 years.
w: markbillen.com
t: @Mark_Billen

★ WORDPRESS, JQUERY, VIMEO

SILVERCAST

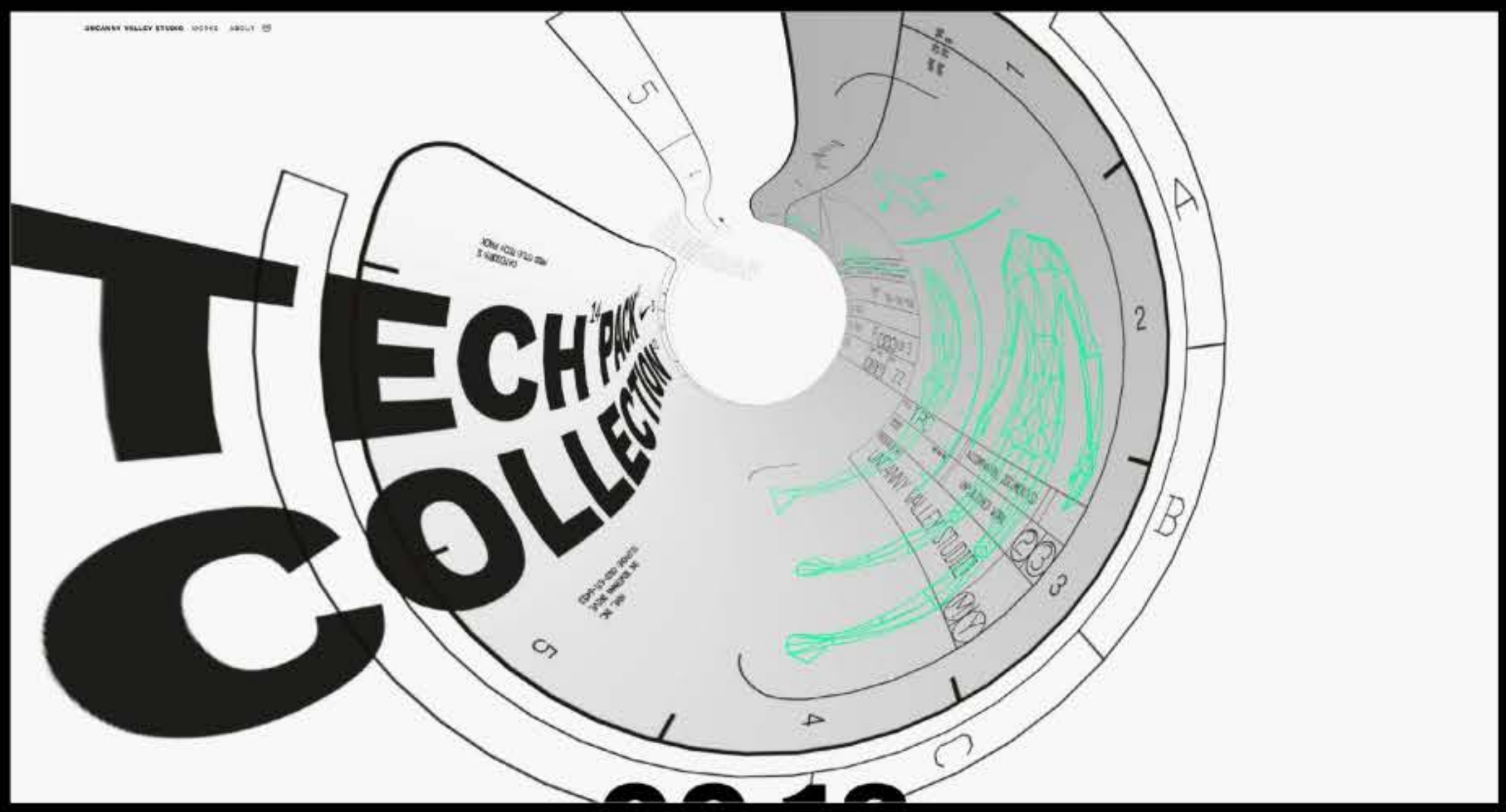
https://www.silvercast.com

If your business is really, really big images, your website should reflect that. Case in point is this eye-catcher by Lounge Lizard for New York's Silvercast Media, a company with over 36 years of expertise in digital and static signage.

The company's dynamic billboard screens, now beaming out adverts in glorious 4k, can be found in key Big Apple locations highlighted here. Preloading with a warning to "Get ready for something big", we land on a suitably browser-stretching HTML5 video background of T-Mobile's presence in Times Square. Looping around in bustling high speed, it immediately sets a context and tone without words or sounds.

From a fly-out menu we then discover portfolio links to featured city spots and beautiful carousels of signage

examples. High-resolution photographs are breathtaking as they roll vertically through the viewport. Vimeo video showcases are seamlessly embedded, illustrating how these next-gen screens perform for real. A nice touch here is the tilt effect for the 'More' links, where the image carousel neatly flips back like a book cover to reveal nuggets of information.



★ JQUERY CYCLE, HEADROOM.JS, THREE.JS

UVS

https://uncannyvalley.studio/

UVS stands for Uncanny Valley Studio, a Parisian interactive design agency that itself stands for quite a bit of cool stuff. Formed and led by a trio of visionaries in Cyril Martin, Marvin Morisse Maclean and Victor Jean Meunier, the studio also boasts skills in art direction, concept development and graphic design.

This domain is clean and pretty straightforward about what the agency gets up to and it would be fairly typical portfolio stock if it weren't so unique, so full of savoir-faire. Arriving with a bang thanks to a full width 'UVS' poster SVG, the Gallic charm offensive kicks quickly into overdrive when the scrolling starts. Visitors are sent headlong into wormholes of 'works' with some mightily imaginative UI rendering, warping and wrapping effects. Achieved using 3D JavaScript framework Three.js, the result isn't merely visually arresting but also eminently usable for navigating the various static case study pages waiting beyond. Here we're treated to video showreels, played and paused via custom cursor, before image assets and credits detail projects for Nike, IKEA, Katlas and more.

All in all, the evidence beautifully underlines the company's assertion that "technologies and interactive mediums are strong narrative vectors" – and with wormholes too, people!

SITE OF THE MONTH

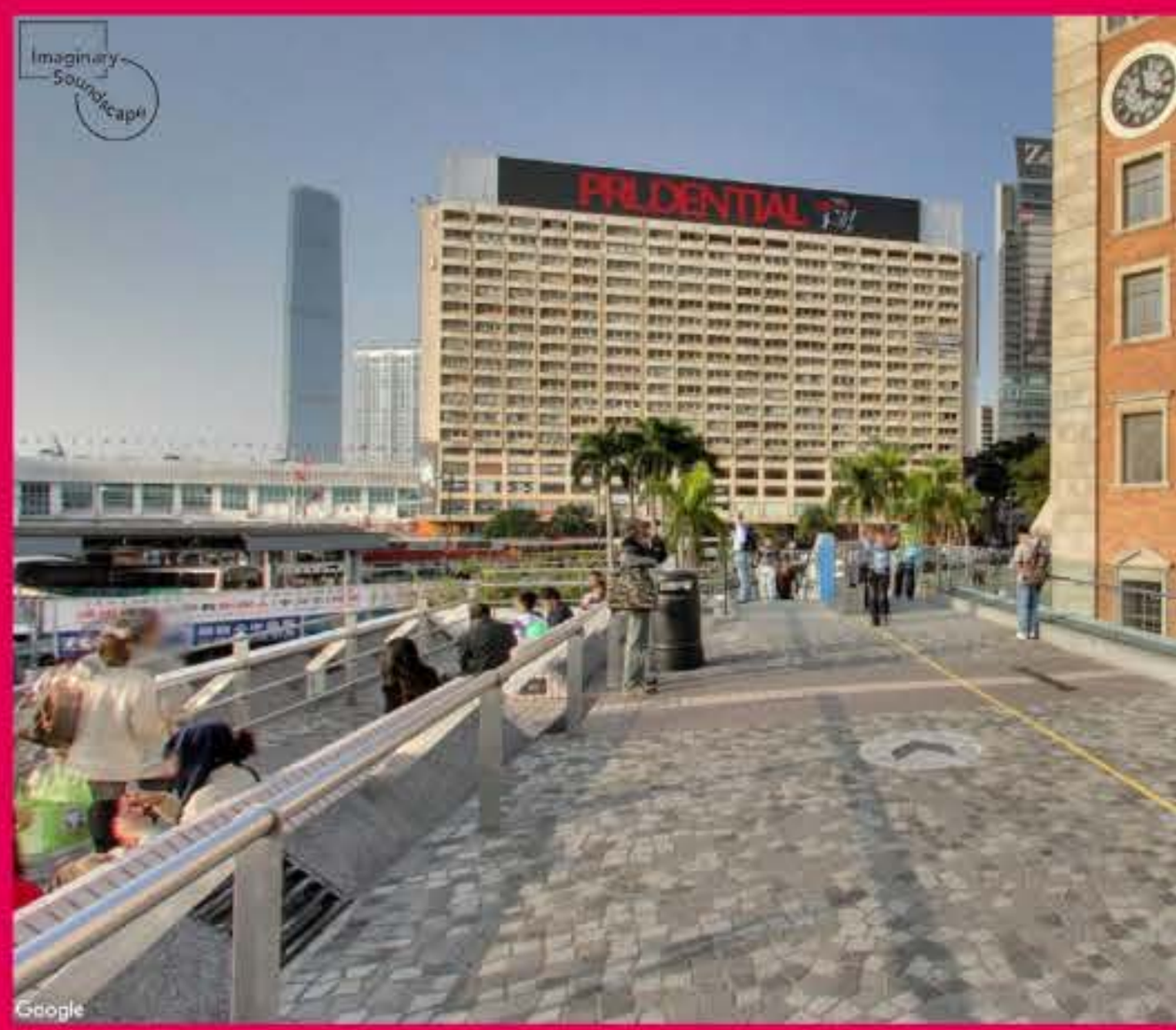
★ GOOGLE MAPS API, VUE, AXIOS

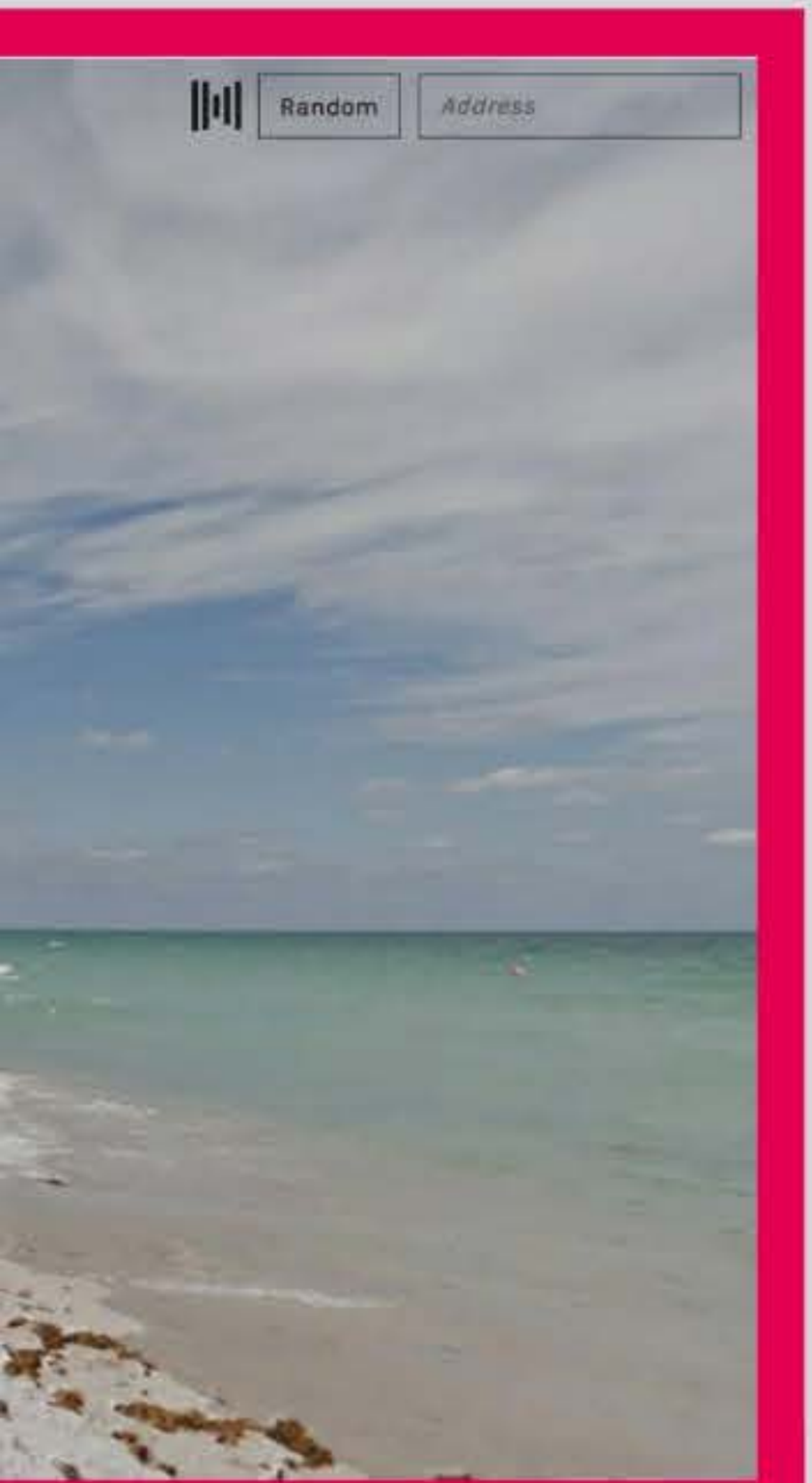
IMAGINARY SOUNDSCAPE

http://www.imaginarysoundscape.net

This intriguing little site describes itself as a web-based sound installation or what translates into a kind of artistic audio-visual experiment. The basic premise of Imaginary Soundscape is about highlighting the relationship between flat 2D imagery and the sound it evokes. Instinctively as human beings we 'fill in the blanks' like this, using memory and imagination to hear the noise within silent still photographs to better realise the experience. But here the algorithmic whizzes at Tokyo's Qosmo, Inc have applied deep learning and cross-modal information retrieval to create an app that does the very same thing.

So what this essentially enables visitors to do is walk around Google Street View and hear the environmental ambience each scene suggests. The result, at least in our tests, was staggeringly accurate and adds a surprising level of immersion to the map. Cities and stations suddenly bustle with chatter and passing cars or trains, while sports stadiums are filled with the echo of players and spectators. It's an amazingly vivid coding achievement but if you think it's all smoke and mirrors you can even test it by uploading your own imagery to see – and, crucially, hear – the results.





★ JQUERY, GSAP, SHOPIFY

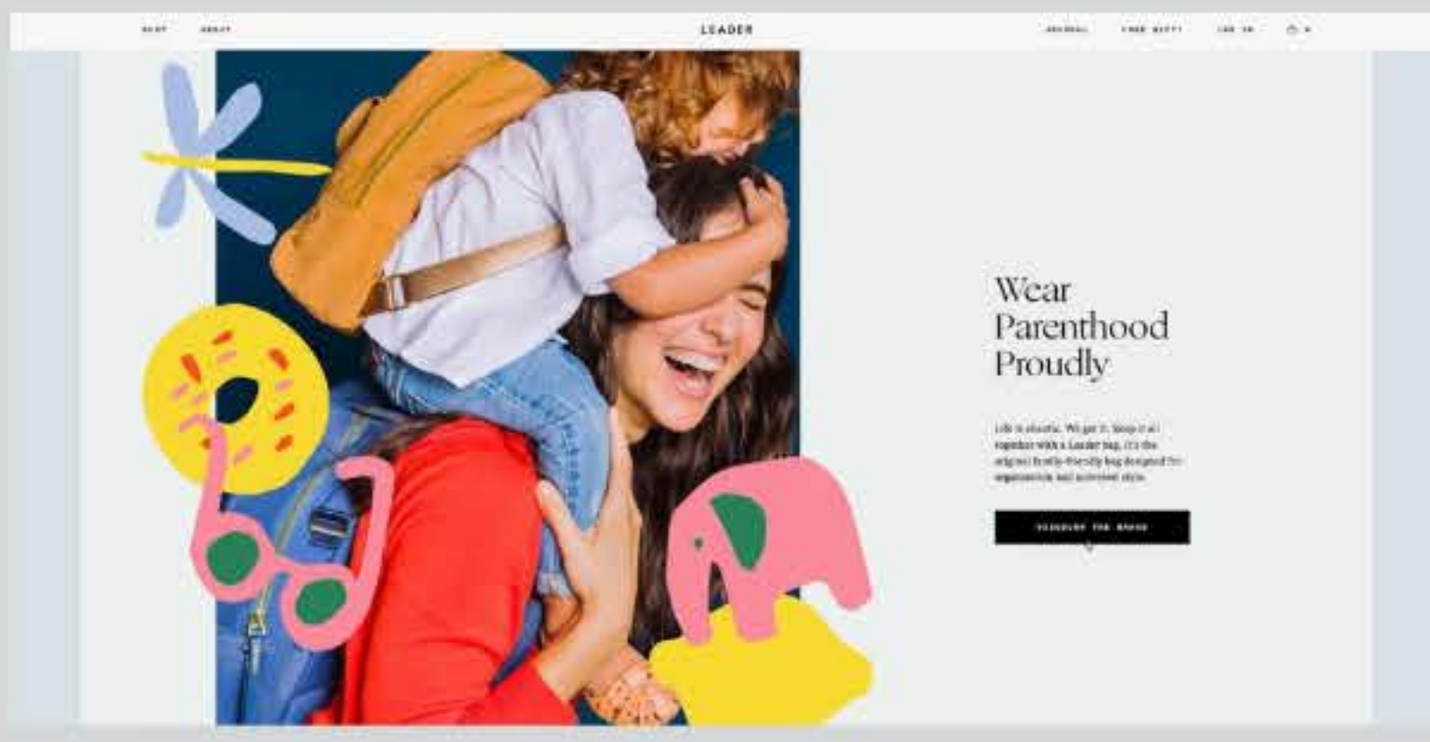
LEADER BAG CO

https://www.leaderbagco.com

Lest we forget sometimes, 'nice' and 'comfortable' can, when done well enough, actually be very effective in web design. It's also not a bad trait to look for in backpacks and satchels either, which segues seamlessly into the charm of Leader Bag Co.

This Shopify-powered ecommerce site provides a lovely reminder that the virtues of clean simplicity aren't a lost art, while adding just enough dynamism and quirkiness to excite. It also communicates brand messages of practicality and child-friendly appeal by applying Lotta Nieminen's playful illustrations to brochure photography. Very subtle dashes of parallax scrolling add enough motion to the clusters of colour, contrasting well against the template's largely white and grey palette. Rollover tiles, badges and buttons offer links through to large, beautifully shot products that do a top job of putting each bag into big or littler hands. A zoom feature offers enough resolution to examine weave-level detail, while chunky UI controls make adding selections to the cart thoughtfully painless.

While the site is entirely framed by such Leader Bag 'values' of love, kindness and wisdom, the latter becomes truly apparent thanks to its consistent smartphone and tablet experience. Developer PRAESENS has acknowledged that "buying but busy" is a thing for millennial mothers and bagged a blinder in the process.



* GOOGLE CLOUD, GOOGLE API, WAVENET

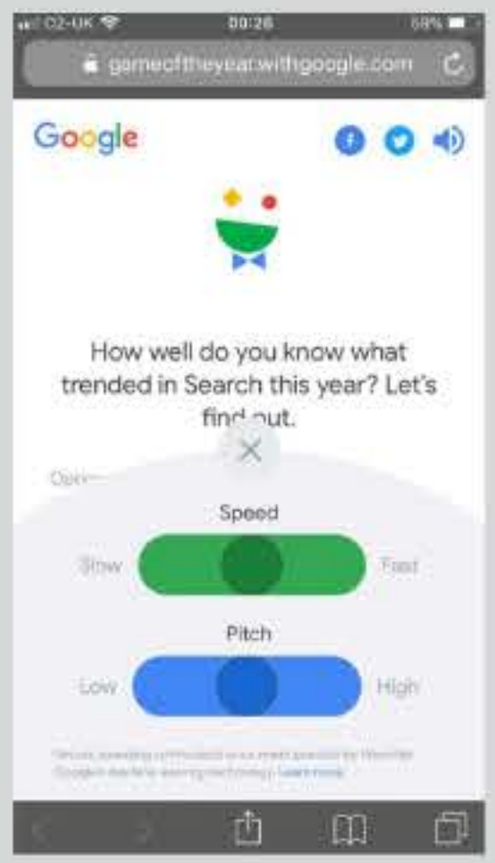
GAME OF THE YEAR

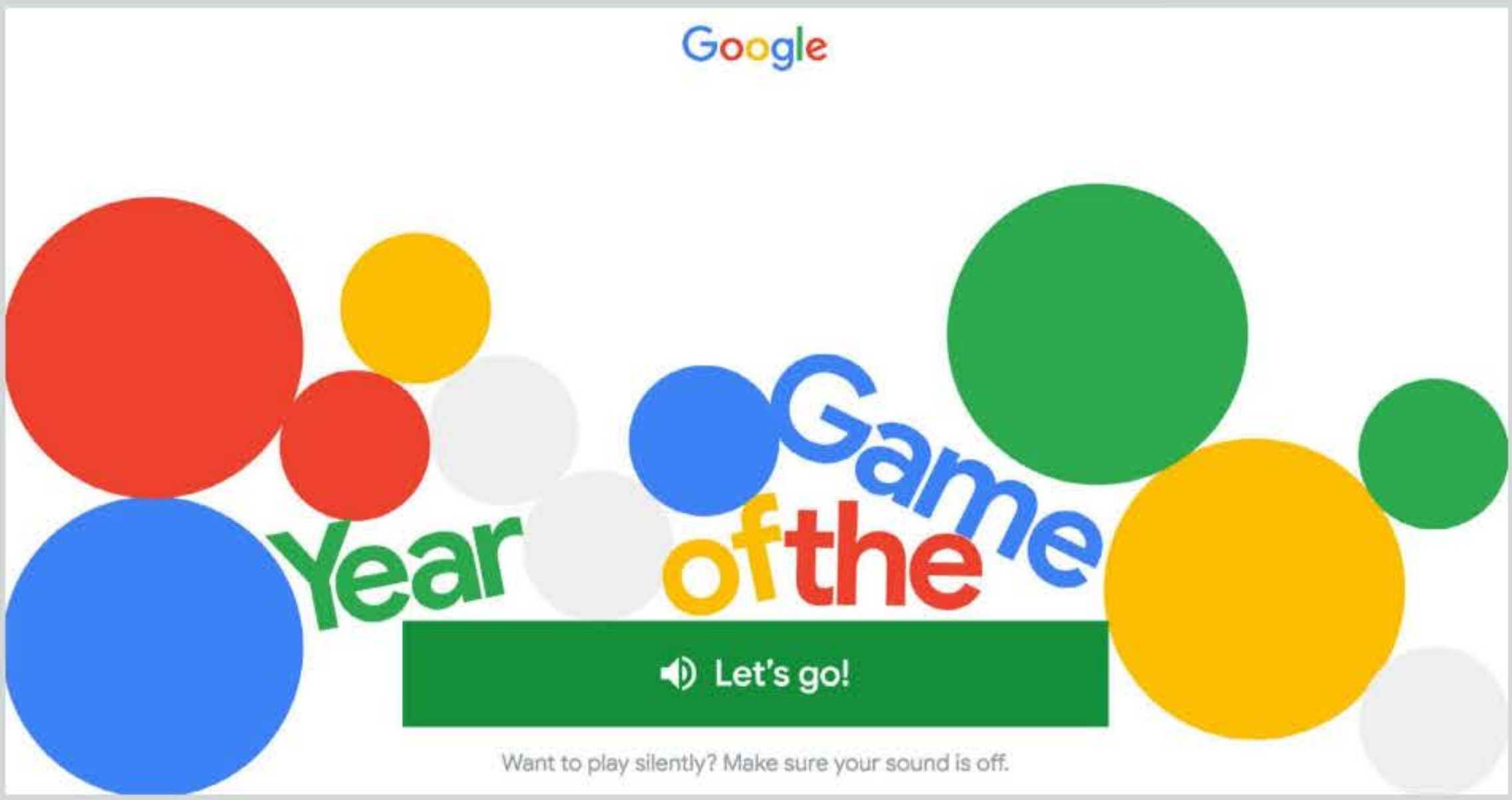
https://gameoftheyear.withgoogle.com

Those clever folks at Google took it upon themselves to mark 2018's Hogmanay with a rather sophisticated web quiz, testing everyone's knowledge of popular search trends.

While of course accessible to desktop browsers, Game of the Year is best viewed as mobile-first and optimised particularly for touchscreen devices. Timed questions are largely multiple choice and require just a thumb tap or swipe to answer, before the inevitable indignity of forgetting bongo cat memes were trendy. Wrong selections wouldn't feel so shameful if Google hadn't coded in a suitably smug quiz host blurting out judgement, but then where's the fun in that? Although at least he can be switched off or indeed customised to speak slower or faster, higher or lower via some intuitive slider controls.

The real point here is to demonstrate the impressive voice synthesis of Google's own machine-learning solution called WaveNet. This text-to-speech technology is based on DeepMind's 'groundbreaking' research in the area to deliver over 30 lifelike voices in 14 languages, accessible to developers via API.





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[†]UNFAO, Global Forest Resources Assessment 2005-2015.

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THIS MONTH FEATURING...

PROFILE 50

We catch up with **Luis Henrique Bizarro**, a front-end developer specialising in stunning WebGL projects for big brands

HOW WE BUILT 56

The team from **Impression** explain how they helped the Whitetail Gin company capture a share of the competitive gin market

DESIGN CHALLENGE

This month...

VEGAN RESTAURANTS

* PROFILES

CHRISTIAN COAN

Full-stack developer at digital marketing company, Crafted.

w: www.crafted.co.uk **t:** @chrisjcoan

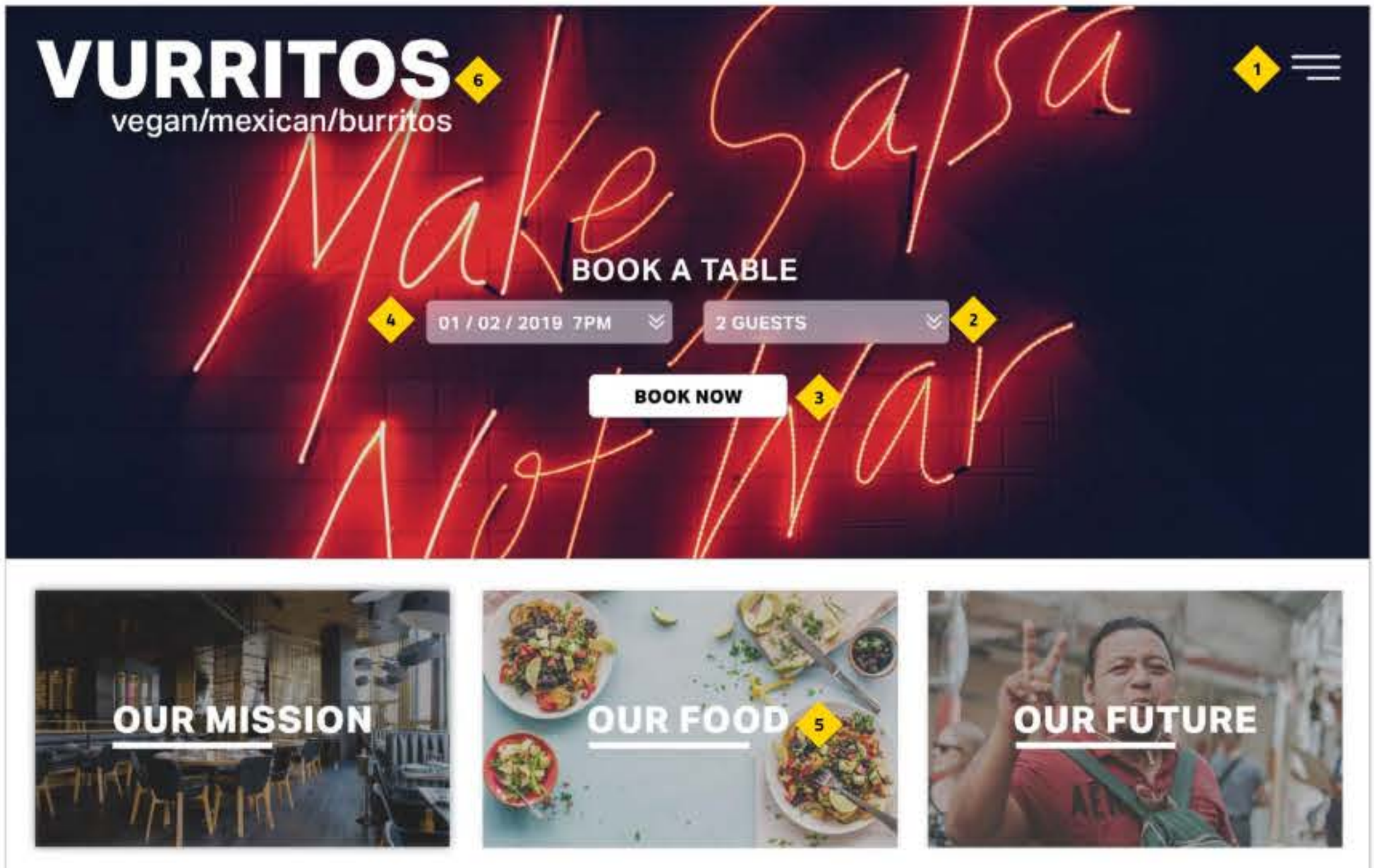
WARREN CHALLENGER

Challenger works as a freelance and contract digital designer.

w: *warch.studio* **t:** @warchstudio

BRIEF

This month we would like you to design an online presence for a new vegan restaurant. The focus will be on name, brand message, the menu and how the content caters for vegans. But it's also important to give some thought to the wider mission of your site.



CHRISTIAN COAN

VURRITOS

A bold new image for a vegan street food restaurant

This site offers a new online presence for Vurritos, a new vegan street food restaurant. I have created a design that enforces the brand's identity through the use of imagery and bold, modern typography. The main feature of the site is the online booking form, which not only replaces the current paper-based method but also offers users an easy, fast way to book a table. The bottom pods enable users to easily navigate to areas of the site most important to the brand and could be part of a slider that would be driven from a content management system. When scrolling, a blurred background is applied to the header and the brand logo and slogan shrinks. The header then becomes persistent, following the user down the page for easy access. The front end consists of built-in modular components using React and GatsbyJS to offer high performance and optimisation for search crawlers. For styling, I used styled components to consolidate the JavaScript and CSS.

CLOSE UP

(1) The burger icon opens a full-screen menu with the navigation options centrally positioned. **(2)** Once it is clicked, the guest's input turns into a custom dropdown that offers users an easy way of adding or removing the number of guests that are required. **(3)** Clicking on the 'Book Now' submit button takes the user to a form where they can fill out further details that are required for them to complete their table booking. **(4)** The date and time picker is a custom control. It gives the user the ability to select a date and time up to and including a date and time specified by the restaurant in the content management system. **(5)** The bottom pods are all configured in the content management system and could also be part of a slider. These work to further enforce the Vurritos brand identity and goals. **(6)** The logo becomes part of a fixed header when the user scrolls down the page. It also becomes a way to link back to the homepage, giving users another easy way of navigating the site.

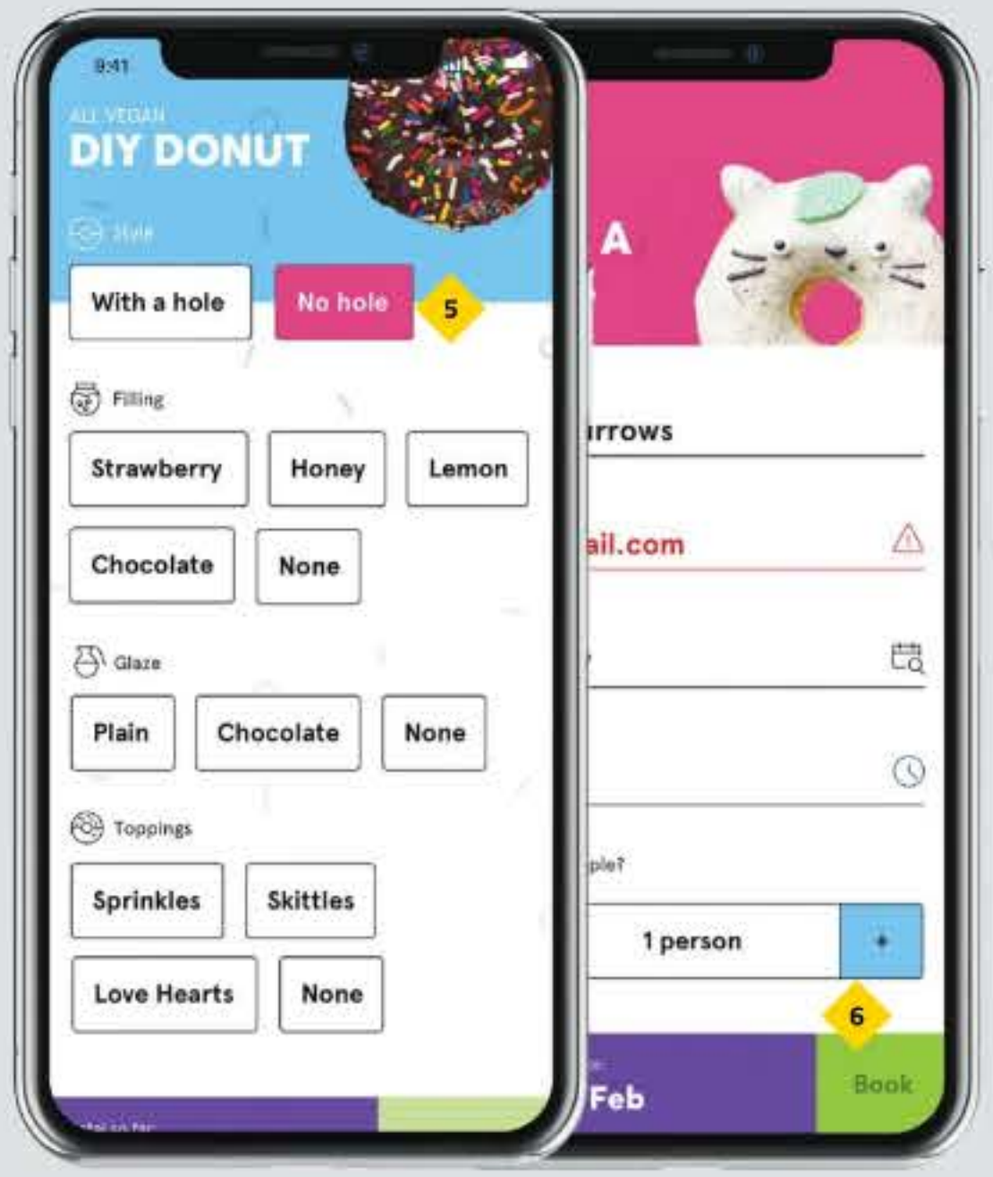
MY MONTH

What have you been working on/doing this month?
I have started implementing a design I created for a local florist. The site will use Instagram's API to return a list of posts associated with hashtags and display these to the end user.

Which two websites have you visited for inspiration?
CodePen is awesome for getting fresh ideas and I love looking through Pinterest.

What have you been watching?
Along with Netflix, I have been watching tutorials on Node.js.

What have you been listening to?
Podcasts, Darknet Diaries and Syntax.fm.



MY MONTH

What have you been working on/doing this month?
The branding for an ecommerce event coming to London plus a brochure website promoting holidays to Japan.

Which two websites have you visited for inspiration?
I use *http://savee.it* to view and gather design/product inspiration. For the We Jammin' design, I drew from the colours on *http://carambarco.com*

What have you been watching?
Killing Eve and the Fyre festival documentary.

What have you been listening to?
I put music on shuffle.

★ WARREN CHALLENGER

WE JAMMIN'

Your one-stop shop for all your doughnut cravings

We Jammin' offers luxury doughnuts with a little less guilt. The name 'We Jammin' is a nod to the dad joke "How does Bob Marley like his doughnuts?" The reason for the Caribbean and fun angle to the name is because if you were a true Rastafari, you would also be vegan.

A colourful and playful feel was essential to follow through with the brand. I achieved this using vivid images of doughnuts and made them clash with bright backgrounds. You should know what the site and brand are all about within seconds of landing on the homepage with product photography and very large h1/title.

You never know when you may want that doughnut fix, so We Jammin' uses state-of-the-art technology to provide users with a full digital experience with or without the internet. Built as a progressive web app (PWA), offering smooth animations and push notifications, you never forget about the tasty new doughnuts launching.

CLOSE UP

(1) A single, immediate and prominent call to action to the doughnut menu to get the user straight into ordering and viewing. I removed all secondary links into the footer. The goal is to whet the appetite and get the customer to order. **(2)** Sharing this website is the primary source of referrals to the We Jammin' restaurant and brand. **(3)** Reassurance messaging lets the customer know that we not only serve doughnuts that are vegan in ingredients but we also combine this with eco and earth-friendly techniques. **(4)** Simple and large doughnut previews, great for accessibility with large click areas but also to display all the information you need before adding to basket. Hovering on the preview card flips the card over to reveal a simple description. **(5)** A mobile-first and friendly doughnut builder. Designed for accessibility and ease of use. **(6)** The customer can also book a table for themselves and friends to have a doughnut-tasting session.

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★ PROFILE

LUIS HENRIQUE BIZARRO

lhbzr.com

We speak to a front-end developer specialising in stunning WebGL projects for big brands

At the age of 23, Brazilian front-end developer Luis Henrique Bizarro (lhbzr.com) has already been in the web business for five years and is currently working from São Paulo as a developer for UNIT9. You've probably most recently seen his work on the award-winning site for London and New York agency, Cult, and he's also worked with big-name clients such as Shell, Nike and Airbnb crafting apps, games and websites using JavaScript, GLSL and WebGL. We got in touch to learn more about him and what he gets up to in his work.

Hi Luis! Can you start by telling us a bit about yourself?
Hey everyone! My name is Luis Henrique Bizarro (which means literally 'bizarre' in Portuguese), I'm 23 years old and I've lived in São Paulo, Brazil since I was born. I have around five years of experience working in the front-end development sector as a freelancer for various advertising, marketing and production companies.

You're currently working with UNIT9. How would you describe your job?
Describing my job really depends on what kind of project I'm working on. At UNIT9, I've had the opportunity to work on a lot of different types of projects even being just a front-end developer. For example, on Nike City Fast, I developed a mobile running game, while ▶

INFO

Location: São Paulo, Brazil

Established: 2014

Expertise: Front-end, games, JavaScript, GLSL and WebGL

Clients: Airbnb, Chevrolet, Discovery Kids, GE, Lufthansa, Nike and Shell

Clients: 2x Awwwards, 3x FWA and 1x Lovie Awards

on Corvette Modules, I developed an audio visualisation based on the engine of the ZR1 car. On Say Yes to the World, I developed a data visualisation with different types of content across a 3D globe. Basically most of the time I'm responsible for helping in the development of anything you can classify as a user interface, so it can be literally anything.

What's the development scene like in São Paulo?
São Paulo is always trying to follow trends from across the world; for example in my circle, I always see designer friends accessing Awwwards and FWA to take some references and try to implement them on their new projects. The biggest problem is some interactions don't work that well in practice, so we have to adapt a lot to make things more viable here. Even the devices are slightly different; for example if you see some statistics from the Brazilian mobile market, you'll find Motorola cell phones on top of the graphs, which is totally different from other countries. Every country has its own peculiarities.

We love your audio-reactive homepage. How did you make it?
Thanks! It's an improved version of one of my first experiments; it brings together two of my favourite web APIs available in the browser, which are Web Audio and WebGL. To achieve this result, I used the Three.js library to help me to abstract the WebGL code and make it simpler, the SoundCloud API to get the audio files more easily from a server and the Web Audio API to analyse information from the audio. Then I wrapped up everything together and what you see is basically many triangles in the shape of a circle scaling together based on the frequency of a specific song. It's pretty simple but I really enjoy having this audio visualiser in my portfolio, even if some people hate music in a website.

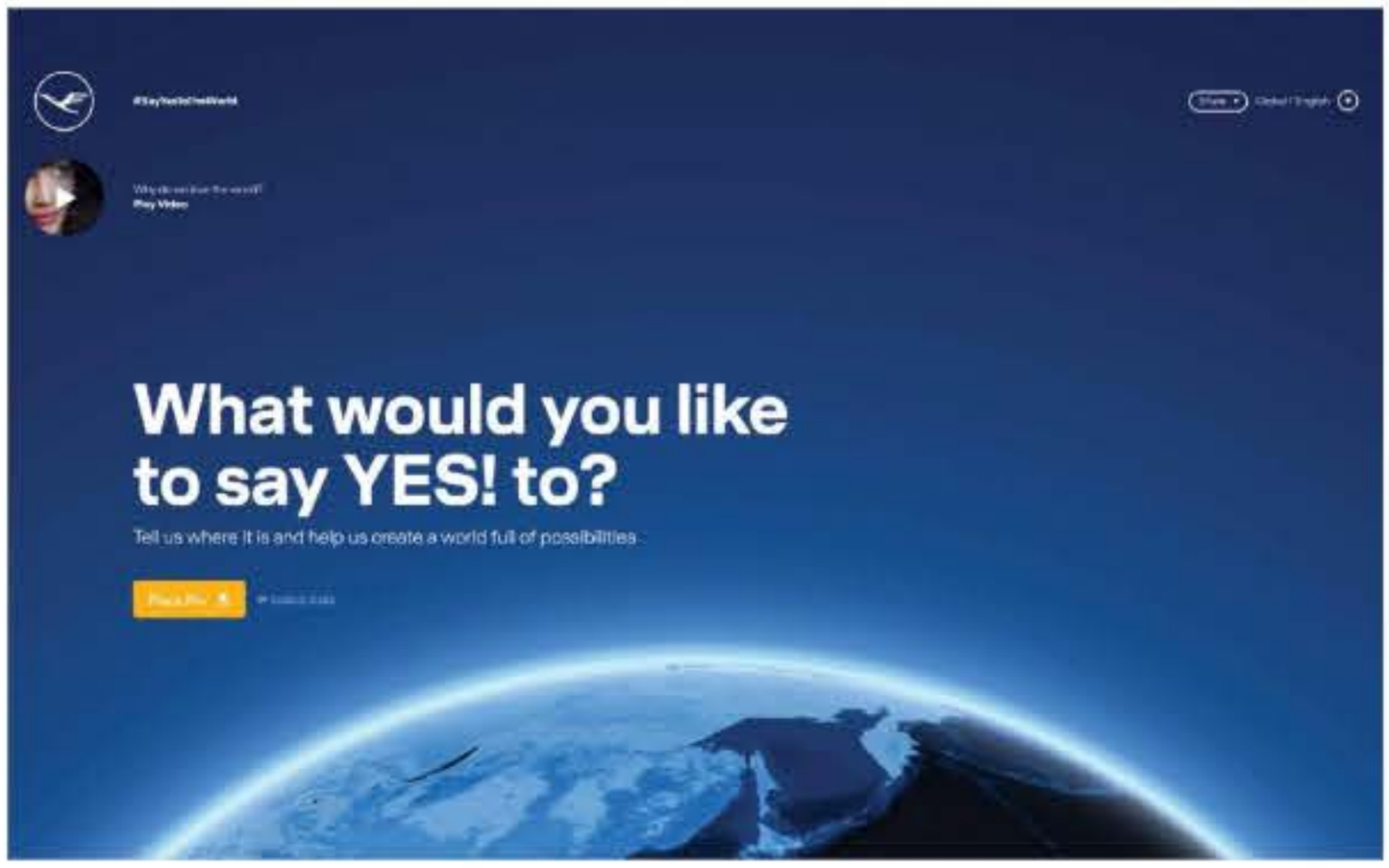
The new site for the Cult agency was created using a concoction of GSAP, Timber, WordPress and lots of custom JavaScript to handle all of the transitions

Shell's Make the Future site showcases clean energy and features a stunning WebGL globe. What sort of challenges were involved?
Shell's Make the Future project (*lhbzr.com/project/shell-make-the-future*) had an amazing team of talented designers and developers. One of the main challenges of the project was being able to find the best way to create the navigation and user flow. We needed to find out how to properly make the camera and the globe move in a smooth way and include the stunning visuals on it without compromising the performance of the experience. And on top of that, we also had to include the user interface without impacting the frame rate of the website. Luckily we had Bruno Imbrizi, who did an incredible job on the WebGL and helped the team solve most of these problems with a lot of experimenting and prototypes.

We also worked closely with 3D designers to improve the number of vertices of the models and sizes of the textures, among other improvements. And the art directors helped us to keep the consistency and quality of the visuals within the performance updates. My role in this project was helping mostly in the development of the user-interface components and the integration of the globe with the rest of the experience. The tech stack of this project was mostly GSAP, React, Redux and Three.js.

Nike City Fast is a great-looking endless runner game developed for Nike and JD Sports. What's the story there?
Nike City Fast (*nikecityfast.co.uk*) is one of my favourite projects because it was a very cool game and it was developed in only four weeks. On this project I had the opportunity to work with a lot of different tools such as PhysicsEditor and TexturePacker. I was also able to work closely with the designers to achieve the best parallax animations by creating useful options inside the GUI of the game. Another cool fact about it is that the entire team was working remotely from five different countries.

You worked on a quiz for TIAA (quiz.tiaa.org) that enables people to find out what kind of Difference Maker they are. What did that involve?
Actually, it involved many different types of expertise and technologies. The first step was creating an AI to detect and differentiate many types of handwriting, one specific for each personality of the experience. Then this AI was trained to classify handwriting and match them with one of the



For the Say Yes to the World project, Bizarro concentrated on developing a data visualisation using various sources of content

personalities. That meant it was time to start developing the front-end, which is where I came in. Our main goal was to create a playful quiz, so we decided to use animations and different types of input instead of the usual boring checkbox or select input. We created different animated illustrations for each question, which you could either drag and drop or click depending on the question to select your answer.

To achieve smoothness, we used the library Lottie and exported After Effects animations directly to code so the entire experience could look very smooth. At the end of the quiz, the user can send or draw their handwriting, so they will be able to find what kind of Difference Maker they are based on all their data.

The new agency site for Cult (*cultldn.com*) has been getting a lot of attention recently. Tell us about your work on that.
That's one of my favourite projects recently because it achieved Site of the Day on Awwwards. Basically my work on this project was leading the development, which was kind of easy because I only had the help of Bianca Reis, another front-end developer from my country. Together we implemented the designs and motion made by Kacper Chlebowicz and Lukasz Schaefer and experimented a lot with the animations until we were happy with the results. On the tech side, it was made using GSAP, Timber, WordPress and a lot of custom JavaScript in order to manage the transitions.

What are the tools that you use the most right now?
The main tool I use right now for absolutely everything is JavaScript. I'm super happy we have finally got to the point where we can use JavaScript to create a lot of different things but right now I only use it to create apps, games and websites. Some people even use it for creating desktop applications and in the back end of a website as well. But in terms of my favourite related frameworks, libraries and plugins, I really enjoy using GSAP and Lottie for the animations, Phaser for creating games, PixiJS and Three.js to work with the graphics, React for complex web applications and React and React Native for mobile apps.

What sort of jobs do you get the most excited by?
I get most excited by visual projects that require me to use Canvas or WebGL. I ▶

★ SPOTLIGHT

LUIS HENRIQUE BIZARRO
FRONT-END DEVELOPER

What's on your desktop today?
My two computers (Mac mini and PC) and a Nintendo Switch.

Little things that make your life worthwhile
Websites: GitHub, Tumblr and Twitter. Apps: Slack, Spotify and Telegram. Audio: Alternative rock, indie rock and indie pop.

What is on your walls?
I only have a dreamcatcher made by a friend who is a Brazilian artisan.

What will you do for lunch?
I'll go to a Brazilian restaurant to eat picanha with rice and rustic fries. (If you've never tried it, I recommend it!)

What hours do you work?
I tend to keep a fixed schedule, usually from 9am to 6pm, but it can vary a little bit based on my current projects.

What else do you do in the office?
When I had to go to an office, I used to talk with my colleagues about creative coding but now I've got the privilege to work from home I can do anything else.

How often do you hang out with other developers?
Less than I'd like to; lately I've been using my free time to focus on other side projects.

Describe your working culture in three words.
Everything is possible.

★TIMELINE

Key dates for
Luis Henrique Bizarro

MAY 2011

Makes his first HTML-only website for a high-school project.

MAY 2012

Becomes a volunteer editor for Tumblr's #Gaming featured tag.

JULY 2014

Starts his career in front-end development at FIAP.

DECEMBER 2015

Featured on Chrome Experiments with his first WebGL experiment.

JUNE 2016

Makes his first game using JavaScript for Discovery Kids.

FEBRUARY 2017

Starts working remotely at UNIT9.

SEPTEMBER 2017

Wins his first FWA of the Day with Nike City Fast.

OCTOBER 2017

Makes his first WebGL commercial project for Corvette at UNIT9.

DECEMBER 2017

Finishes his Bachelor's Degree in Information Systems.

DECEMBER 2018

Wins his first Awwwards Site of the Day with Cult.

The Nike City Fast game is one of Bizarro's favourite projects. Built over just four weeks, it gave him the opportunity to utilise lots of different tools

really enjoy achieving amazing effects using code, so I always try to challenge myself and follow the references from the designs and motions exactly, which most of the time are slightly unusual on the web. But that's why I always say that 'everything is possible'; we just need to find the right balance between code, design and motion.

Who do you think is doing the most exciting work on the web at the moment?
Nowadays there are a lot of amazing companies doing really incredible work on the web. Things are becoming very competitive, so it's hard to pick just one but I think Active Theory is very consistent with its work; all of the websites it makes are extremely fast, even the ones that use a large amount of WebGL stuff.

Can you tell us what it is you're currently working on?
It's actually a top secret project but what I can reveal is that I'm working on a WebGL prototype that makes use of real-time fur rendering. When working on these kinds of prototypes, I enjoy using a straightforward Webpack configuration backed up by libraries such as glslify and Three.js.

Where do you see your career going over the next few years?
I see myself becoming more expert in WebGL and having the opportunity to work more with this technology. Right now, even using it in a good number of projects each year, I don't feel that comfortable implementing some things. I still have a lot to learn, so my main focus is to improve my knowledge of computer graphics. Another plan that I have is working in another country when I find the right opportunity.

What do you love most about your work?
The thing I love the most is that working with front-end development is one of the most important parts of an application, no matter if it's an app, game or website. Basically you're responsible for all the interactions that the user will have with your system, so your work has a real impact on the success of it. And the second thing I love the most is that I'm always working with different types of interfaces, so I've been able to create things that I'd never imagine I could before. I never expect to be working with a game until it happens and I become super proud of the final result when I see my friends playing and enjoying the experience I've created.

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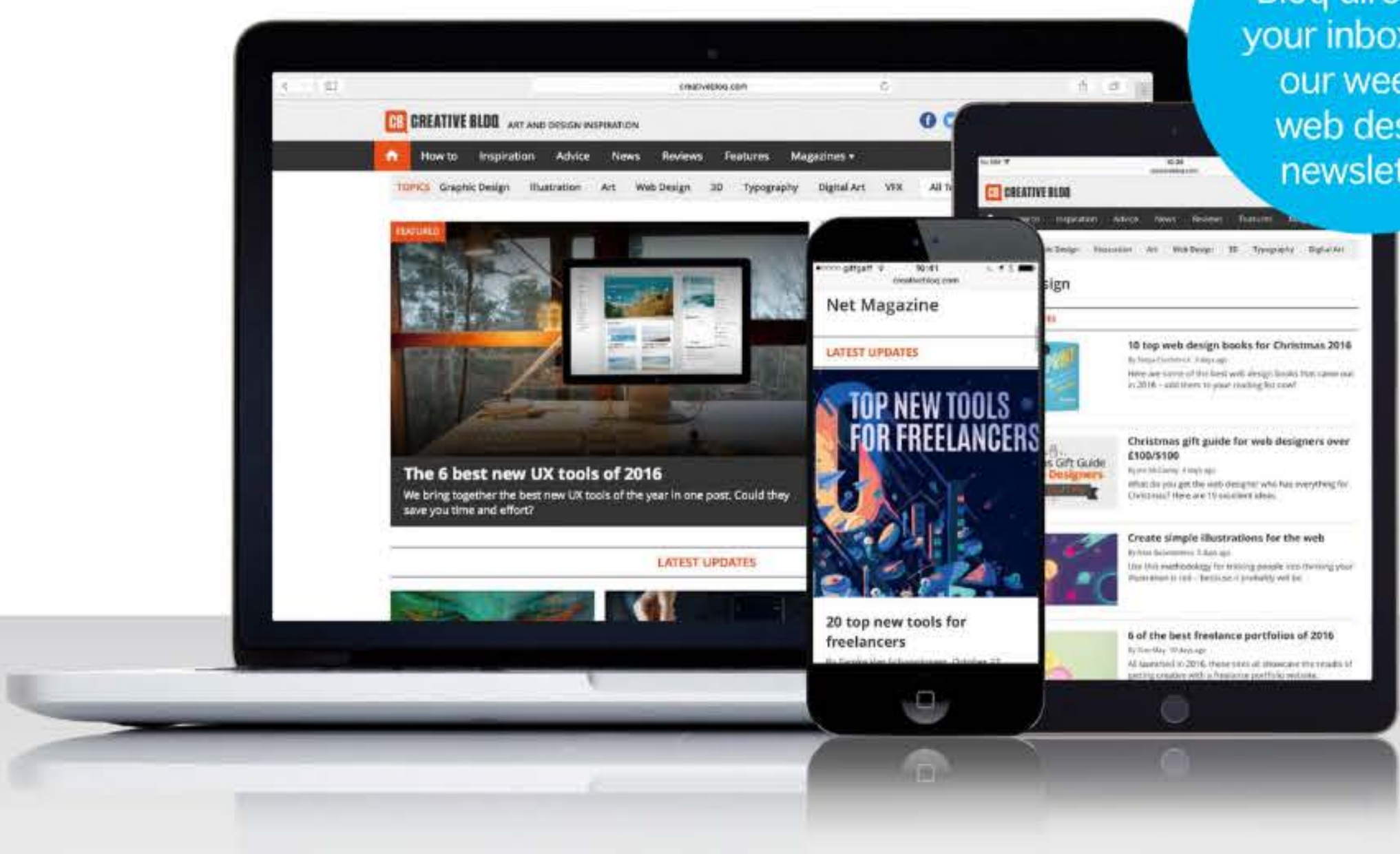

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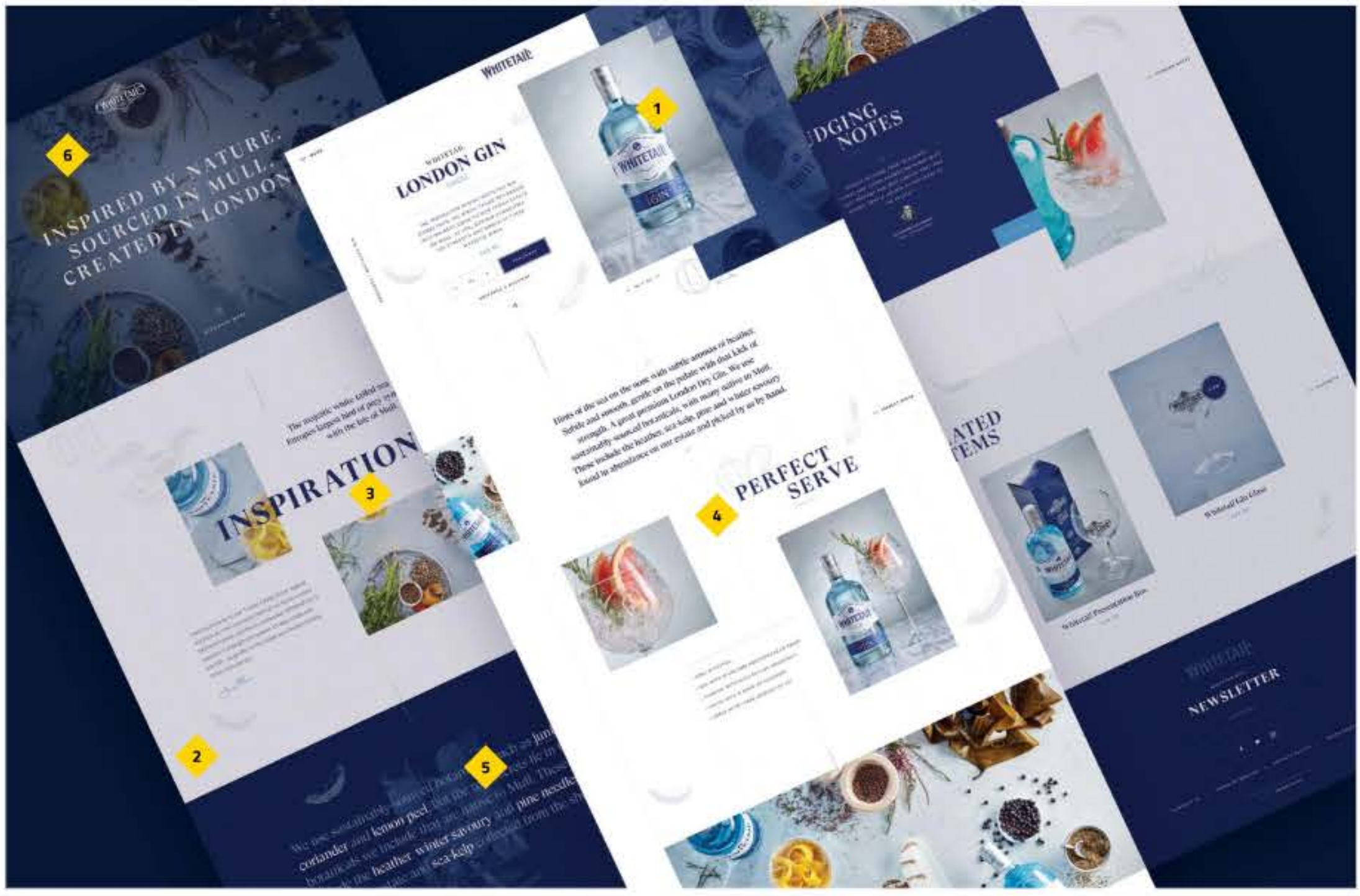
HOW WE BUILT

WHITETAIL GIN

The team from Impression explain how they helped an ambitious young distillery capture a share of the competitive gin market



BRIEF

Fast-rising gin brand Whitetail Gin required an eye-catching site to tell its story and consolidate its position in a crowded and competitive market, so it brought in Impression to create its luxurious web presence.

CLOSE UP

(1) We recognised that photography was key in the design of this project and commissioned an established food and drink photographer to ensure we had the best imagery to work with. **(2)** To enhance the brand identity, we incorporated feather elements from the packaging, which are used throughout to intensify the sense of depth and movement. **(3)** No Google Fonts here! We acknowledge typography contributes so much to the look and feel of any website. With this in mind, we married two beautiful typefaces together to complement the brand. **(4)** The informative product detail page hosts elements designed to attract and convert sales. **(5)** The botanicals section on the homepage provides an interactive display that invites the user to hover over important words to gracefully reveal the related image. **(6)** We wanted to pack a punch when landing on the homepage and decided to develop an elegant liquid reveal above the fold.

JOE HAMILTON

Account manager at Impression. Hamilton was the key project manager on the project.
w: *https://uk.linkedin.com/in/joe-hamilton-314bb359*

LOUIS SAVILLE

Head of design at Impression. Saville was the lead creative digital designer for the Whitetail Gin site.
t: *@louis_saville*

ELLIOTT MANGHAM

Front-end web developer at Impression. Mangham was the lead developer on the Whitetail Gin project.
t: *@elliottmangham*

Based on the Isle of Mull in Scotland, Whitetail Gin (*https://whitetailgin.com*) is a startup gin brand that takes its name from the white-tailed eagle, which is Europe's largest bird of prey and synonymous with the Isle of Mull. The gin market has become an incredibly crowded space but in a very short space of time Whitetail has won awards for its gin and packaging design and has also managed to get stocked in major retailers. In need of a suitable online presence to supplement this fast-rising brand, Whitetail brought in digital design agency Impression (*www.weareimpression.co.uk*) to create its site. We spoke to the team to find out more.

What was the client looking for from this site and what was Impression able to bring to the table?
JH: The client wanted to work with an agency that could bring a high level of creativity and outside-the-box thinking but on a relatively tight budget given its startup status. It was important that we bought into the story behind the brand and we've clearly communicated this through the new website. Whitetail liked the fact that we're creatives first and foremost but we don't just design what we think looks cool; we use data and insights to inform UX decisions.

What did your UX process involve?
LS: Following an in-depth research phase where we carried out stakeholder interviews, market research and data analysis, we created low-fidelity prototypes to explore navigational structures, hierarchy of content and the purchase journeys. Following this we created more refined high-fidelity prototypes that we hooked up to InVision so the client had a fully clickable prototype to test before we went into build. To help the client envisage interactions and page transitions we created a number of animations using InVision Studio to illustrate how it would work in build.

How would you describe the site's main design features?
LS: Firstly, understanding the space the client is in was key to finding the perfect blend of luxury and boutique. We solved that by combining the elegant serif typeface for headlines and the geometric body font, adding the use of natural textures and subtly animated hand-drawn elements to really emphasise the story we were trying to tell. The on-scroll animations added gloss to the unique grid layout and created depth and some extra visual interest. We were lucky enough to have access to some stunning product and lifestyle imagery, which we were able to use to great effect to create an immersive brand experience.

There's a really eye-catching liquid effect on the homepage. How did you make that?
EM: Since our initial proposal, we registered our intention to design and develop something truly exciting for Whitetail Gin. One of our ideas was to ▶

TIMELINE

Key dates in the Whitetail Gin project

MAY 2018
Project kick-off meeting and discovery phase, which includes understanding the brand, market, audience and audit of existing website.

MAY - JUNE 2018
Impression puts together wireframes.

JUNE 2018
Carries out a two-day studio photography shoot.

JUNE - JULY 2018
Starts work on concepts and testing different mixes of serif and sans serif typefaces.

JULY - AUGUST 2018
Creates specification and design for mobile, tablet, desktop and also Retina design.

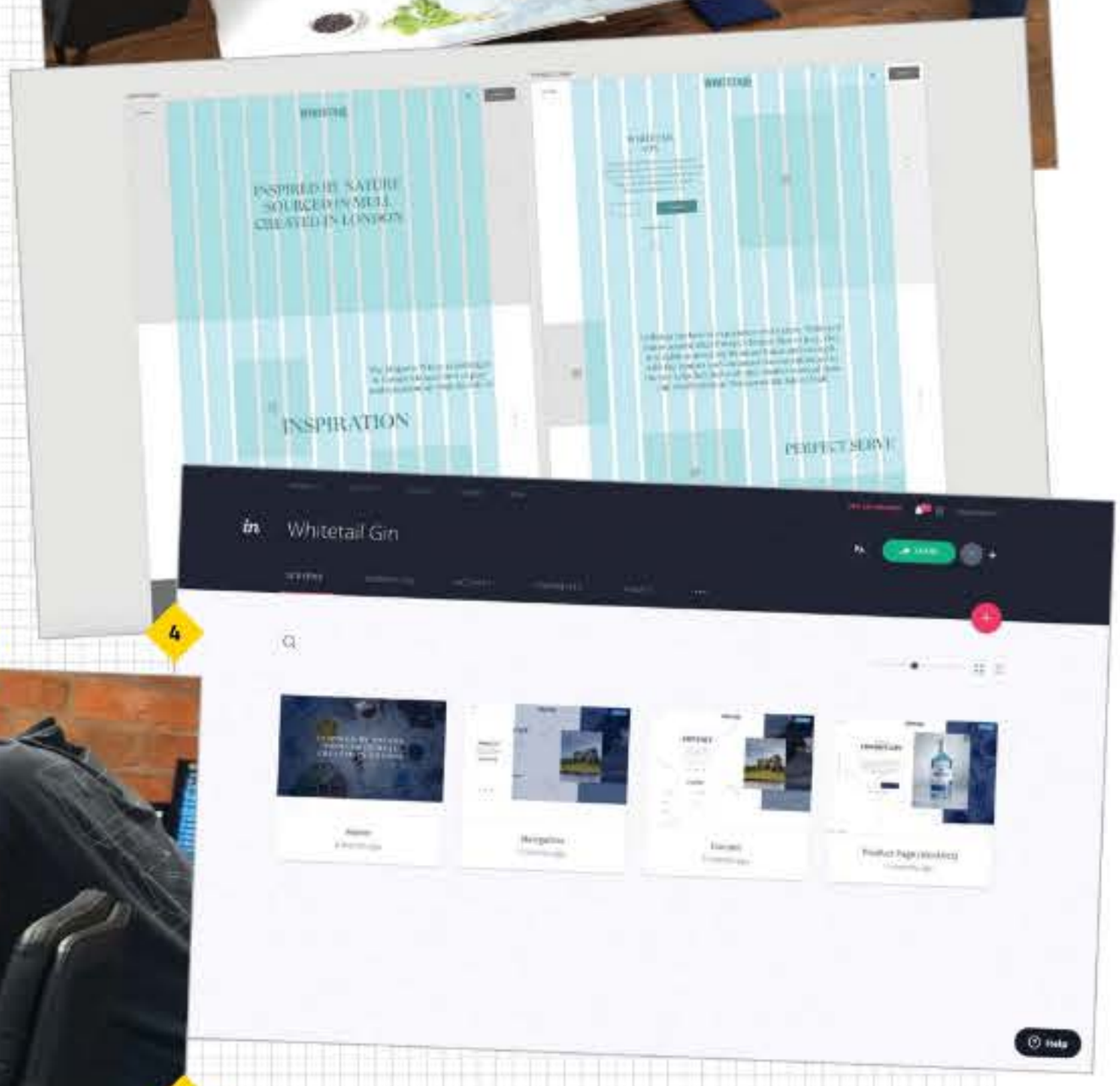
AUGUST 2018
Creative is signed off and the HTML is developed.

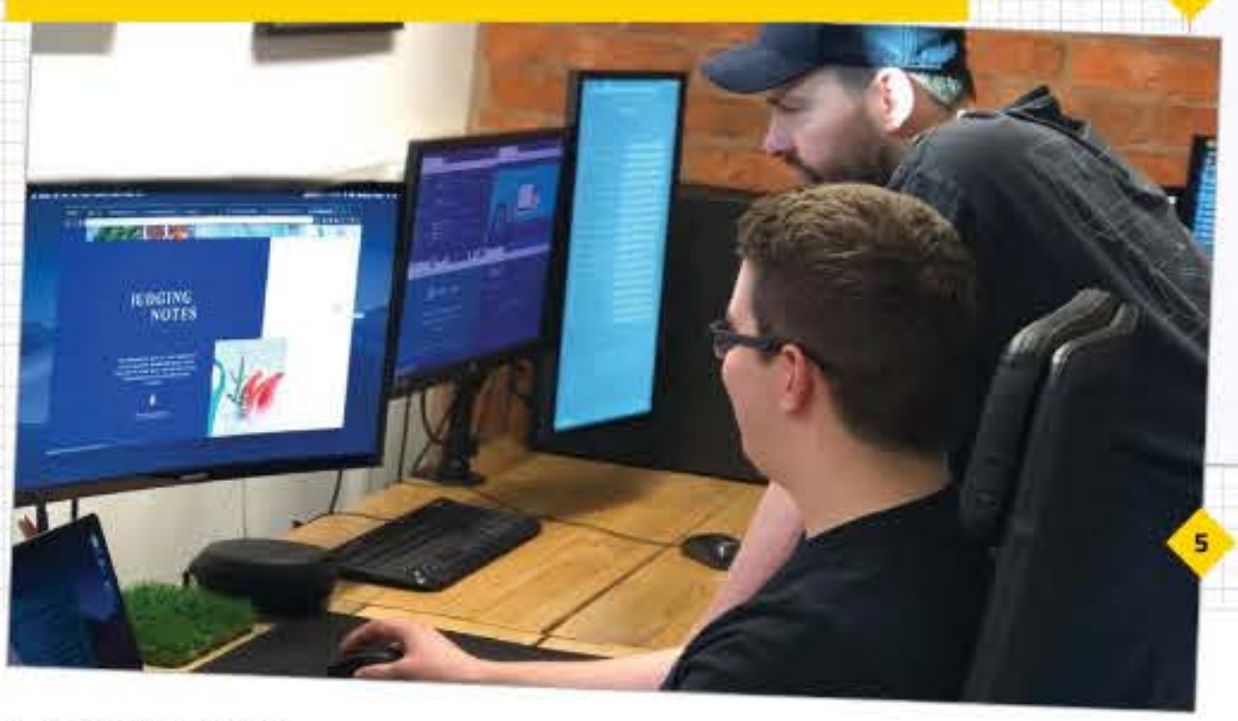
AUGUST - NOVEMBER 2018
Impression carries out build and ecommerce configuration.

NOVEMBER 2018
Conducts extensive cross-browser and device testing of responsive behaviour and design consistency. Carries out speed optimisation.

DECEMBER 2018
Site launches.

DECEMBER 2018
Receives FWA, Awwwards and CSS Design Awards recognition.





EVOLUTION

(1) The main objective from the client brief was to tell the story behind the product and its origins on the Isle of Mull. **(2)** Because of the client's remote location, we knew the kick-off meeting would be key to extracting as much information as possible, as there would be little chance for face-to-face meetings in the future. **(3)** We identified that photography would be very important to the project and the lack of assets available to us meant we decided to organise a photography shoot. We used a great food and drink photographer and the images we got back were fantastic. **(4)** From the information collated, we were then able to produce low-fidelity wireframes, which we created in Adobe XD. We find this a great tool for its ease of use and speed. During the design process, we collaborated with the client via the InVision app. The client was thrilled with what we had produced so very little amends were needed to the initial designs. **(5)** The designer worked closely with the developer to achieve the finishing touches and flourishes on the site that really make it stand out. The great thing about working so closely is we are able to really get across the designer's vision into the final design.

complement the nature of the brand by creating a liquid effect that takes centre stage when you first enter the site.

This desired effect is mostly comprised of a surprisingly unpopular JavaScript helper that was originally developed to draw and animate images on hover using Three.js and GreenSock TweenMax. We utilised this remarkable utility to implement the foundation of the concept and worked to adapt this effect to the design and requirements of the project.

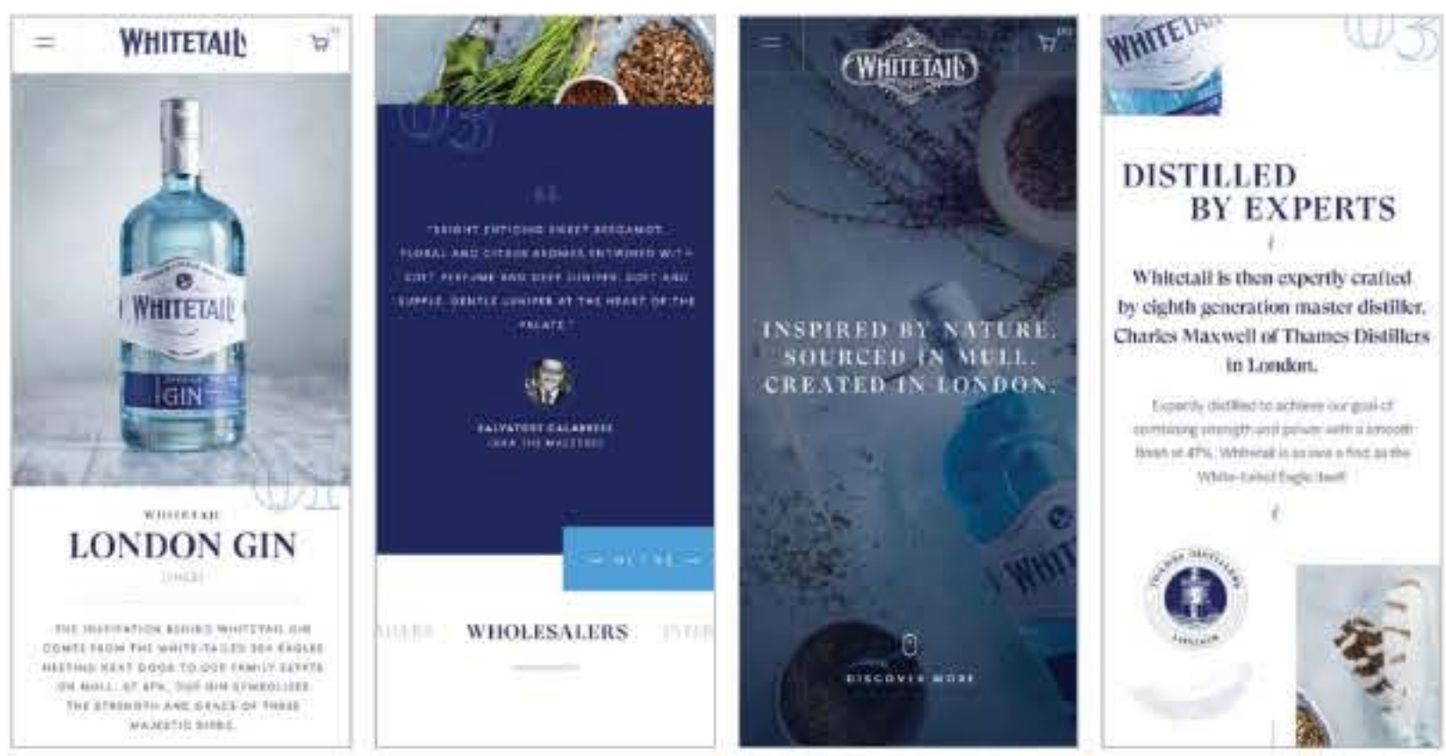
What technologies are running the site?
EM: We applied a highly modular approach to our development workflow for all front-end assets like CSS, JavaScript and theme files, which makes working on the Whitetail Gin site a breeze! At the heart of our workflow is Gulp, which is heavily utilised to run important tasks that make significant optimisations and debugging to our code on the fly.

When it comes to styling, we dropped Sass some time ago in favour of PostCSS. The freedom to expand allows us to make huge steps in speeding up development time, removing bloat, improving legacy compatibility and truly optimise the end result. Thanks to the ever-growing community, there's always something new to get excited about!

How did you approach testing?
EM: We combined physical testing with BrowserStacks' powerful infrastructure. This allowed us to conduct tests on all major devices with their corresponding operating systems and browsers.

Being able to fix issues instantly is one of the intrinsic values of our Gulp setup, which scans our code base while we develop and appropriately inserts the relevant prefixes. In addition, we are immediately informed of any errors, along with a simple report of the offending code. This workflow helps us not only fix issues faster but prevents issues from arising entirely.

What was the biggest challenge you faced on this build?
EM: Probably the unrestricted composition of elements within the layout. The free-flowing design inherits assets from the brand identity, most commonly in the form of the illustrations of feathers. These feathers suggest depth, scrolling above and below other elements on the site in a scattered scene relative to their parent section. To achieve this, we made each feather a recurring partial, sharing the same harmonious code base with adjustable rotation, position, scroll speeds and depth. You may also notice how they flicker when you enter via the age gate!



Top Impression used a food and drink photographer to snap Whitetail Gin's sumptuous ingredients in-situ
Above The agency's work on Whitetail Gin's mobile site netted it an Awwwards Mobile Excellence award

Now the site's live, what's the reception been like?
JH: It's been overwhelming! We've received comments from the design industry, media and other agencies. The client has been really impressed with what we've achieved and it's always good to pick up some awards along the way. The site got Website of the Day on CSS Design Awards and a Mobile Excellence award on Awwwards, among others. The whole team dedicated a great amount of passion and energy into the project, so it's great to see it pay off!

THE FUTURE OF MOBILE DESIGN

Nick Babich shares key design principles that will guide the way we're designing mobile sites in 2019

Just a decade ago, designing for the web meant designing for a desktop; now it means designing for mobile and desktop. Mobile phones are driving an increasing amount of web traffic and the numbers are only going to grow. According to Statista, in October 2018 we had 3.9 billion unique mobile internet users and more than 50 per cent of all website traffic worldwide was generated through mobile phones (*https://netm.ag/2HCNXrD*). A great web design is no longer a luxury but something of a necessity.

Creating a great web experience for mobile users requires more than just making your design responsive though. In this article, we'll uncover the foundational mobile-site design principles.

AUTHOR

NICK BABICH

Babich is a developer, tech enthusiast and UX lover. He runs a blog called UX Planet dedicated to user experience and counts advertising, psychology, and cinema among his myriad interests.

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Build a solid foundation for goal-oriented experience

Mobile users are very goal-oriented users. Each time they visit a website, they have a specific task they want to accomplish and they expect to get what they need really quickly.

Picture your ideal users: Similar to building a house, building a website starts with a solid foundation. And the foundation for great web design is the knowledge you have about your users. User research should be one of the first steps in product design. You need to figure out exactly who your users are and what they want to accomplish. Once you know your users' wants and needs you can then create a user journey that you know matches their expectations perfectly.

Refine experience around your core objective: What do you want to achieve with this website? Finding the answers to this question is another important thing to do when creating mobile web experience. Are you trying to drive engagement, make users purchase products or sign up for a service? Clearly state the goal and think of how you can cut the number of steps a user must take to reach it.

Adapt your content to work in a smaller space

Content is what provides value for most websites. It's the primary reason people are visiting them. When it comes to mobile web design, it's impossible to take a desktop experience and replicate it on mobile; it's important to design websites with mobile users in mind. That means we need to adapt content and features to accommodate the user's screen size and habits.

Avoid horizontal scrolling: Users are comfortable with sites scrolling vertically but not horizontally. That's why there shouldn't be pages where horizontal scrolling is required to see content. Fixed-width elements are one of the common reasons that cause horizontal scrolling, so check you don't have content that only displays well at a particular viewport width.

Aim for a single-column layout: Single-column layouts help with managing the limited space on a small screen and also enable easy scaling between portrait and landscape mode.

Make sure users don't have to pinch-to-zoom: Visitors can be easily frustrated when they have to zoom in or out in order to read a text or see an image. Design your mobile site so that users won't ever need to change the size:

Use legible font size: Eleven points is the absolute minimum size for text. This size enables users to read text at a typical viewing distance without zooming.

Select fonts that scale well: If website experience requires reading, it's better to use sans-serif typefaces such as Helvetica or Roboto.

Make product images expandable: Many studies have proven that people are predominantly visual learners. Most people are able to understand and grasp concepts far better when they are delivered that way, which is why using images in web design is a great way to sum up key messages quickly.

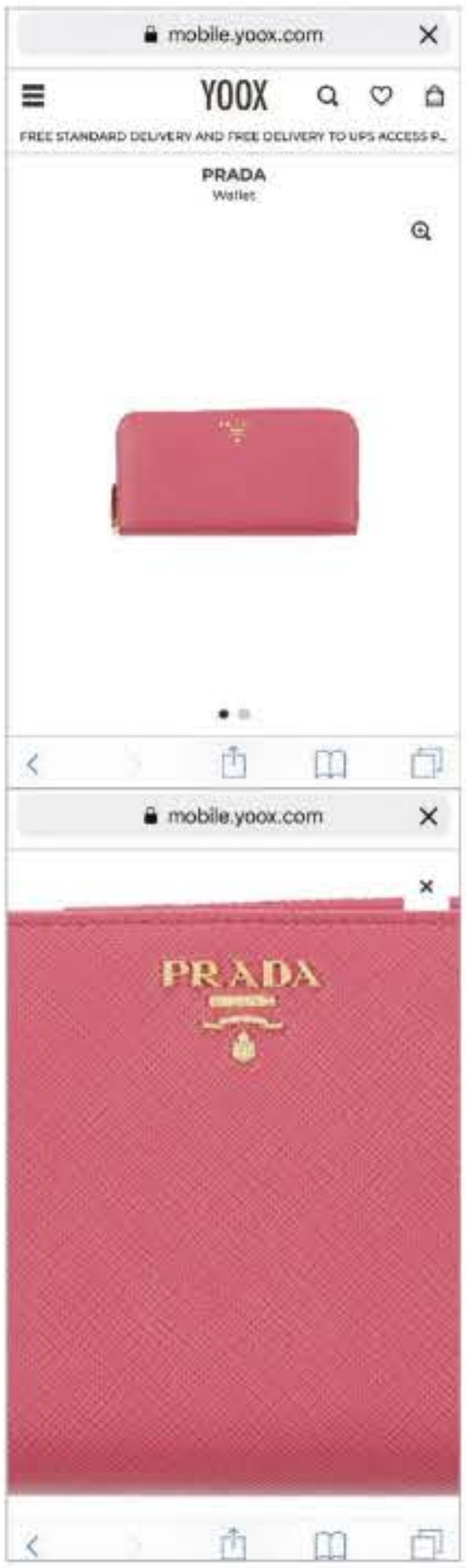
Images play a vital role in ecommerce websites – people rely on product images when making a decision. It's essential to not only provide high-quality assets but also make them expandable so that users can easily see them in detail. Expand the whole image rather than just a part of it.

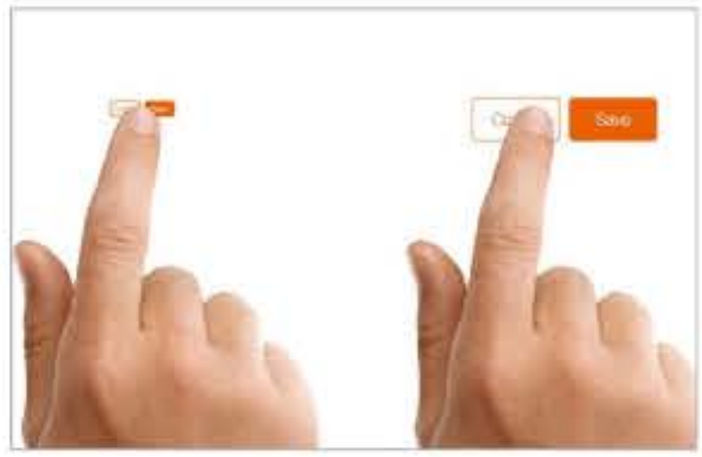
Finger-friendly design: When you design a mobile site, remember visitors will use their fingers instead of a mouse arrow and human fingertips are larger than a mouse pointer. Strive to design a finger-friendly interface where each interactive element is sized appropriately.

An MIT Touch Lab study (*http://touchlab.mit.edu/publications/2003_009.pdf*) found that the average size of a fingertip is 8-10mm, making 10mm x 10mm a good minimum touch target size.

Also consider the relative distance between touch targets. If interactive elements are located too close to each other, mobile users can accidentally tap a wrong button with their finger. To prevent that from happening, make sure to correctly size buttons and also add enough space between them.

Be careful with promotions and ads: Promotions and ads can easily overshadow the content. While the ad's message might work for some visitors, in a majority of cases users





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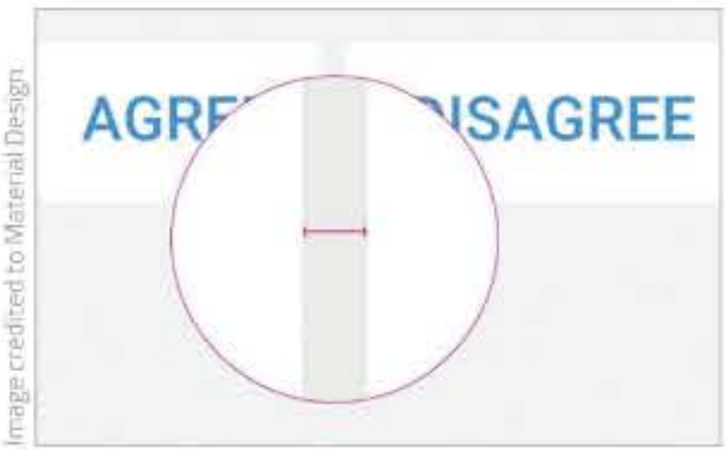


Image credited to Material Design

Opposite page: Helvetica scales much better than Lobster Two font

Above: Ecommerce site visitors expect to view high-resolution close-ups of products. Yoox enables visitors to see a product in detail

Top right: Too small touch targets vs appropriately sized targets

Top right bottom: Relative distance between buttons

skip it and move on to more valuable information. This phenomenon is known as banner blindness.

Make it easy to find contact information: Mobile users often visit websites to find contact information. Depending on the urgency, users might want to call a company, fill out a contact form or find the address. For ecommerce websites, the phone number should be available right on the home screen.

Optimise content for scanning

It's a well-known fact that users don't read online; they scan. When a new visitor approaches a web page, the first thing they try to do is scan the page and divide the content into digestible pieces of information. It's possible to make this task easier for users by following a few simple rules.

Mind the order in which you provide content on a page: People read from top to bottom. That's why it's important to preserve the important stuff at the top of a page and move the rest down according to hierarchy.

Cut down the clutter: Prioritise content over user interface elements – reduce distractions by removing unnecessary functional and decorative elements. ▶

CREATE A PERCEPTION OF SPEED FOR SLOW INTERNET CONNECTIONS

When we design a website, we often take high-speed internet connection as granted. As a result, we optimise web experience for the ideal scenario. But for many parts of the world, GPRS/EDGE connection is still there. That's why it's vital to design for slow internet connections.

There are two tricks designers can use to create a perception of speed:

All too often visitors see a blank screen while content is loading. If loading takes more than three seconds, visitors start to believe that the site is too slow (*https://www.nngroup.com/articles/website-response-times/*) and many abandon the website. It's possible to prevent this feeling using skeleton screens. Skeletons (aka temporary containers) are placeholders that designers use to identify content sections while content is loading. Skeletons not only create a feeling of fast loading, but they also introduce visual hierarchy to users before they even see the actual content.

For heavy content such as images or videos, it's possible to use lazy loading – load low-quality or even blurry images first and then, as the page continues to load, replace them with the high-quality versions.

Lazy loading in action – a placeholder image is loaded at page load (left) and the final image loads when scrolled into the viewport

EXPLORING PERFORMANCE OPTIMISATION

Great UI design is only part of a mobile site's success – it's important to get the technical side right as well. Performance optimisation is a huge topic, so if you want to research it in detail, it's worth checking out Front-End Performance Checklist 2019 (*https://netm.ag/2TlslMa*). You'll find a lot of useful techniques for performance optimisation in the guide. Below are just a few practical tips on minimising page size for rapid loading from this guide.

- Compare your website with competitors. According to psychological research (*https://netm.ag/2SbDibu*), if you want visitors to feel your website is faster than a competitor's site, your web experience need to be at least 20 per cent faster.
- Don't use fancy animated effects. While fancy animations such as parallax can work great for desktop users, they can be intrusive on smaller screens.
- Evaluate each framework and dependency you use. A Netflix case study (*https://news.ycombinator.com/item?id=15567657*) shows that it's possible to significantly improve a site's performance by optimising dependencies.
- Run an inventory of all of your assets. Images, videos, fonts – all should be evaluated and optimised.
- Enable Brotli compression on the server. If that's not possible to do, enable Gzip compression instead.
- Test your website on an average device. Don't use the latest iPhone for testing, use a device from a mid-to-low category, a device that is most representative of your audience.

It's vital to establish a performance culture in the long-term – performance has to be measured, monitored and refined continually. Make sure metrics and measurable performance goals influence any design decision.

- Strive to create a minimalistic style because by doing that you'll make it easy for the user to focus on the task.

Avoid long blocks of text without images: It's highly likely any huge swathes of content will be skipped. Use headings, paragraphs or bullet points to break up text.

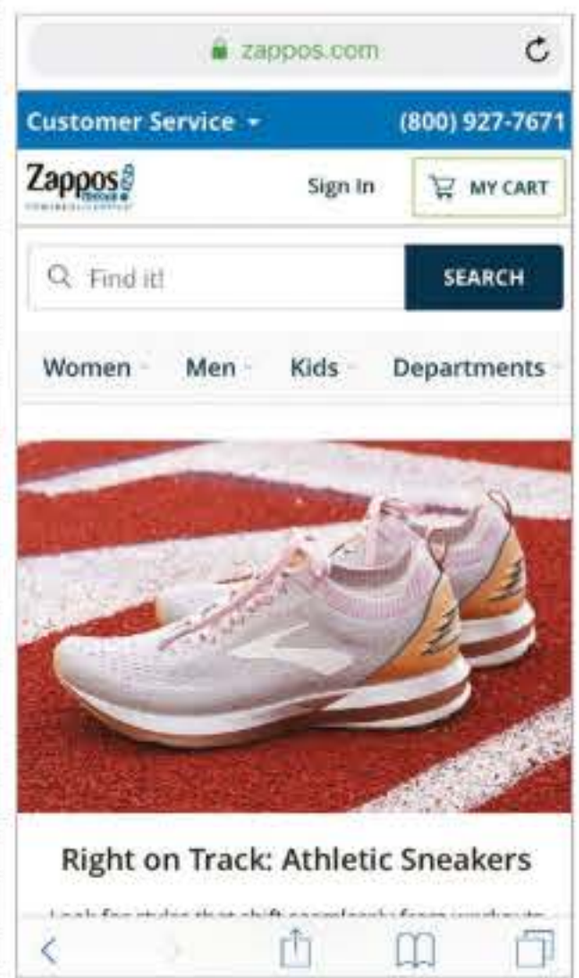
Put more visual weight on important elements: Make important elements such as key messages focal points so visitors see them right away. Emphasise elements using different sizes, whitespace or vibrant colours.

Create predictable navigation

Helping users navigate should be a top priority for every website. After all, the most compelling content is useless if people can't find it. That's why it's important to invest in designing a solid navigation system.

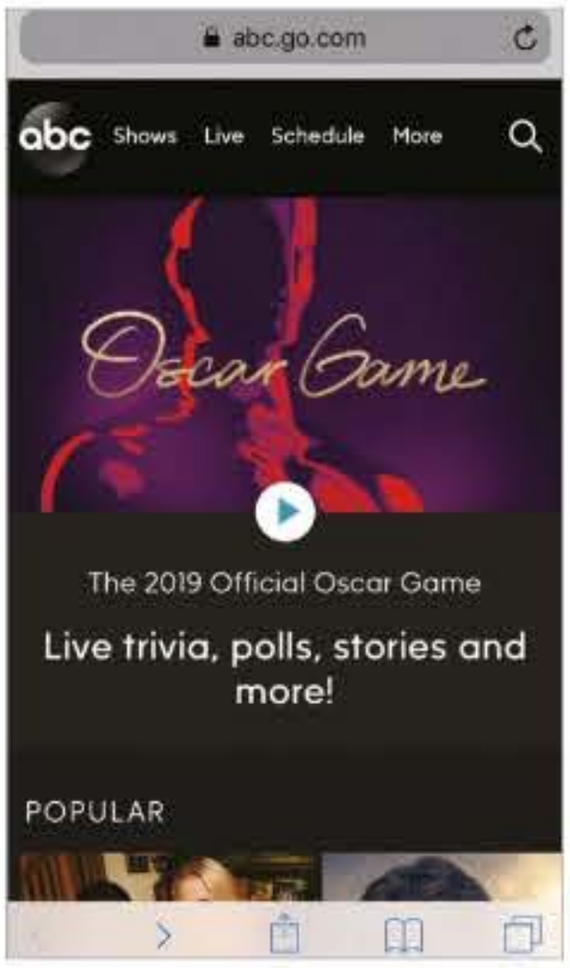
Use familiar navigation patterns: When it comes to creating a navigation mechanism for your website, it's worth remembering a simple rule: don't reinvent the wheel – strive to create a familiar experience. It's always better to rely on navigation patterns that most users are familiar with (such as top navigation bar or hamburger menu) rather than create your own unique navigation system (eg gesture-based navigation system). When you create familiar navigation, you help users to rely on their previous experience when interacting with your product.

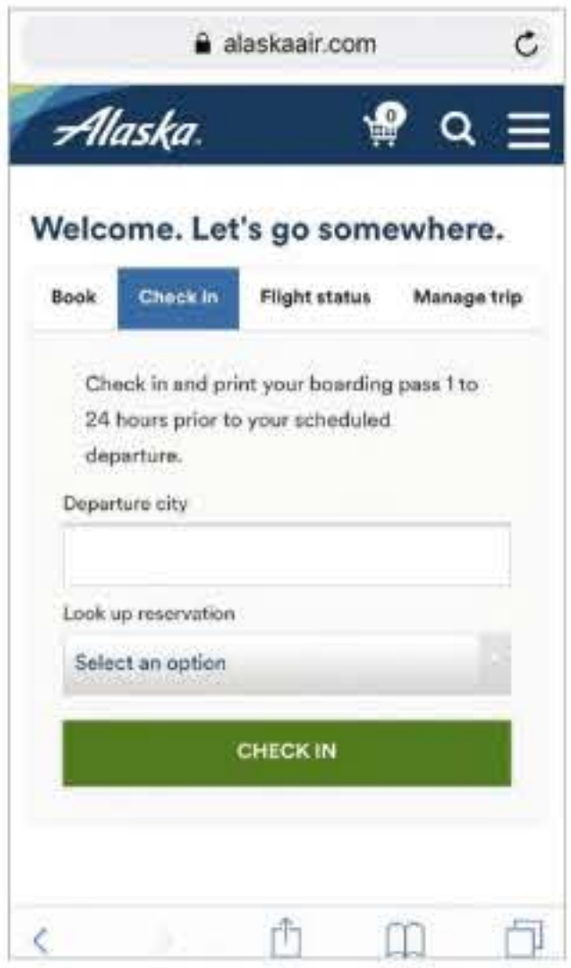
Put a limit on the total number of navigation options: Don't put too many options in menus. An extensive menu might work well for desktop sites but they don't fit mobile design. Since not all navigation options will be available in a visible area of the screen, you'll force mobile users to scroll through a list of options. Think how you can present the fewest menu items possible. Ideally, the menu you design should have no more than seven distinct categories (*https://en.wikipedia.org/wiki/The_Magical_Number_Seven,_Plus_or_Minus_Two*).



Top: Ninety per cent of the homepage at Abercrombie & Fitch is dedicated to promotion. As a result, users have to scroll down to select the right category.

Above: Zappos provides a customer service number at the top of the page.





Far left ABC provides only the top priority options in its navigation menu. All secondary options are hidden behind 'More'.

Middle CTA button on Alaska Airlines is located in a visible area of the screen and has a contrasting colour that captures the user's attention

Left: ASOS places search at the top of the screen for its mobile website

Prioritise navigation options: Organise navigation based on the way users work with functionality. The most popular navigation options in a global menu should go at the top and the primary actions should be available in a visible area of the screen.

Ensure interactive elements look like interactive elements: When designing buttons and links, think about how the design communicates affordance. How do users understand the element as an interactive object? The way an object looks tells users how to use it. Visual elements that look like links or buttons but aren't interactive (such as underlined words that aren't links or rectangular boxes with words that aren't buttons) can easily confuse users.

Write clear labels: Each navigation option should have a clear and concise label. Avoid jargon – the navigation you design shouldn't contain terms your visitors won't understand. Clear labels will give visitors the ability to predict the result of their actions.

Communicate the current location: "Where am I?" is a fundamental question to which users need an answer in order to effectively navigate. Clearly indicate the current location.

Provide a search feature: If you design a complex site with a lot of content or features, you need to ensure that you provide a search bar for easy navigation. By implementing search functionality, you provide a quick route to information/features for mobile users that come to the site with a specific question in mind.

> "VISUAL ELEMENTS THAT LOOK LIKE LINKS OR BUTTONS BUT AREN'T INTERACTIVE CAN CONFUSE USERS"

Don't hide the search option in the menu. It should be one of the first things visitors see on your pages.

Make it easy for users to return to the homepage: Visitors expect that when they tap the logo at the top of a page they will return back to the homepage and they will become frustrated if that doesn't work.

Keep your user in a single window
Avoid calls-to-action that send a user to new windows. Some users will have trouble switching between windows in a mobile browser and might not be able to find the previous page.

Avoid creating roadblocks

Roadblocks create friction and friction is the worst enemy of conversion.

Don't interrupt visitors: Large pop-ups are one of the most typical types of interruption on the web experience. For a long time, such banners were dedicated to promo messages but, recently, many sites started to use distracting pop-ups to get permission to use cookies (GDPR). No matter what information you want to show to your visitors, make sure it does not distract from the overall experience.

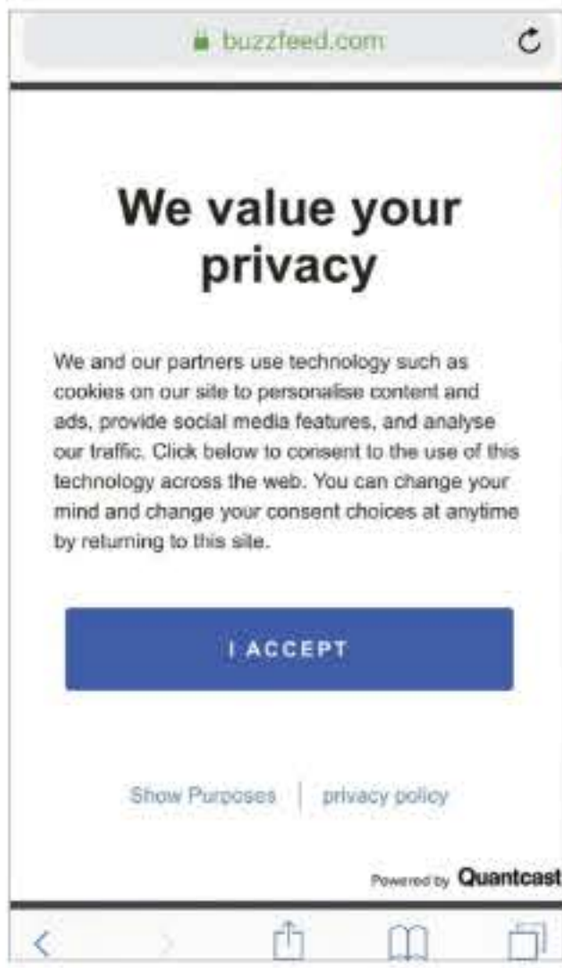
Don't force users to sign up:
Demanding users register before they can see information or use an online service has a high interaction cost (*https://www.nngroup.com/articles/login-walls/*) – forcing registration too early can cause users to abandon the site. Before providing personal information, visitors want to get a sense of what a site offers them.

To create a user flow with the least barriers to conversion, mobile sites

Right Both BuzzFeed and The Next Web use pretty distracting techniques to deliver the message that they use cookies

Far right Netflix asks users to sign up before they can see what content will be available to them

Opposite page Reasons for abandonment during checkout according to Baymard Institute



should enable visitors to explore content without needing to sign up. For ecommerce websites, it's essential to let users purchase as a guest.

Don't make users leave your website: Identify places in user journeys that might cause a user to look outside your site and then provide content/features to keep them on your site. A promo code field on ecommerce websites is perhaps the most common example that makes visitors leave a site in the attempt to find the coupon. It's much better to offer some coupons right on the site in order to prevent such behaviour.

Make it easy to switch to another device to continue the journey: Do not consider mobile as stand-alone experiences. A typical user has several devices such as a desktop, mobile phone and tablet and expects to have a seamless experience across all those devices when using your product. For example, many people use mobile devices only for product search and then switch to desktop to convert. Users expect to continue the journey from where they stopped on mobile.

Here are a few things you can do to synchronise a user's current progress:

- Sync wishlist, favourites and basket for a user account.
- Offer an easy way to save or share information across devices for non-registered users (such as an option to send the link to email).

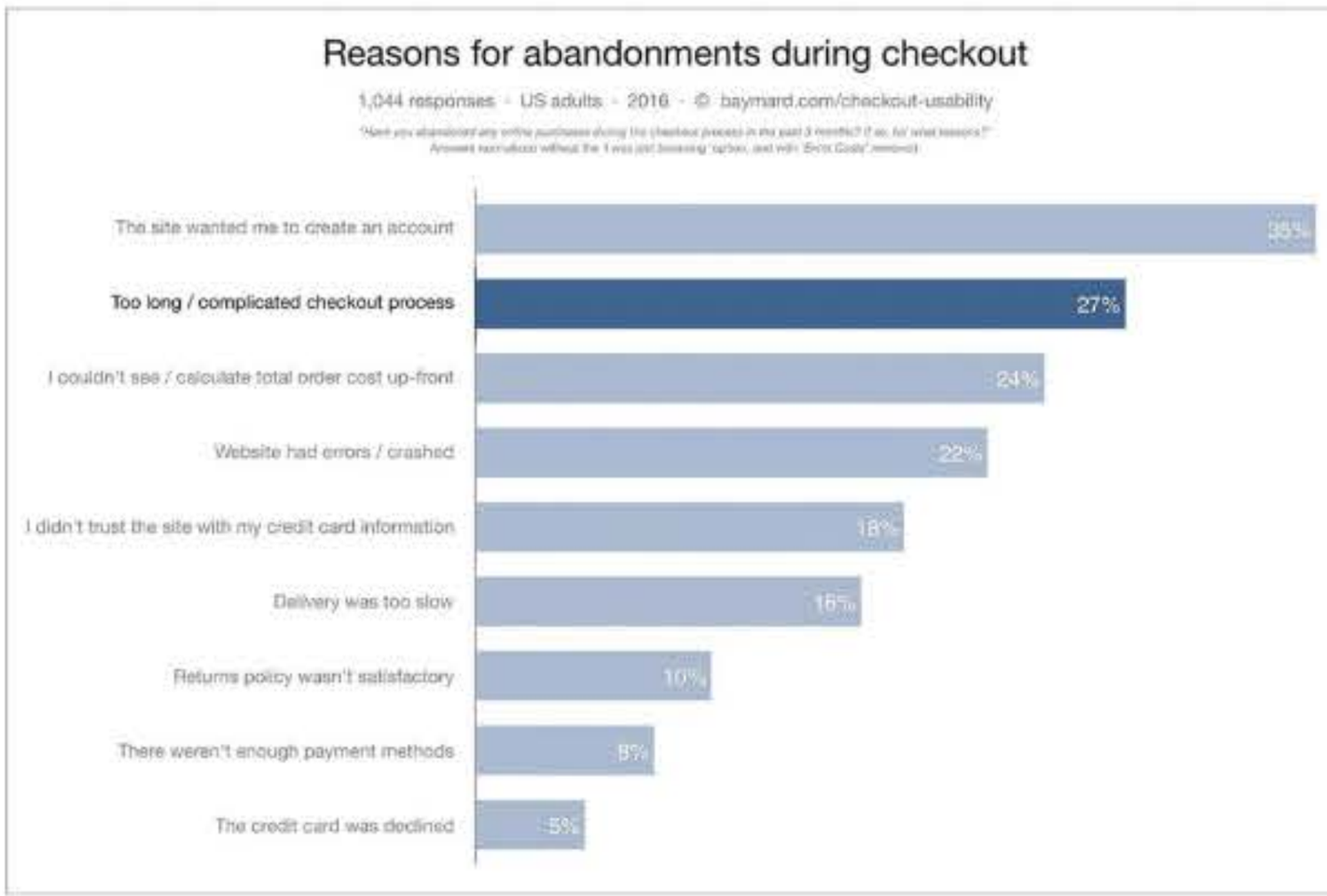
Design efficient forms

Form entry is one of the most common tasks on the web. It's hard to imagine any experience that doesn't require users to fill out some kind of form. Because it is such a ubiquitous practice, the ability to fill out a form pain-free is crucial to keeping a user engaged.

> "THE LESS DATA A USER HAS TO PROVIDE, THE MORE THEY'LL ENJOY YOUR WEB EXPERIENCE"

Minimise inputs in forms: Generally speaking, the less data a user has to provide, the more that they'll enjoy your web experience.

- Minimise the total number of fields. Always keep forms as short and simple as possible by removing any unnecessary fields. Ask only what you really need to know.
- Use auto-correct, auto-capitalisation and auto-complete to reduce the chance of user error.
- Avoid drop-down fields. Dropdowns hide the options and this creates extra interaction cost – users need to tap twice to select the right option. If you're using a drop-down field for a selection of options, consider replacing it with radio buttons.
- Automatically move to the next field when a user presses return.
- Minimise form errors with real-time inline validation.
- Use existing information to maximise convenience. For example, you can pre-fill some fields such as shipping address or billing information for your registered users.
- Think about offering alternative input mechanisms. Consider what device capabilities can be utilised to provide a better user experience. For example, instead of asking users to type credit card details, provide the option to use the device's camera to scan the card and integrate systems like Apple Pay and Google Pay to enable payment in one tap.



Provide matching keyboard: Mobile users appreciate websites that provide an appropriate keyboard for the field. This feature prevents them from having to perform any extra actions. For example, when users need to enter a phone number, your website should display the numeric 0 to 9 keypad.

Set HTML input types to show the correct keypad. Here are seven input types relevant to form design:

- input type="text"` displays the mobile device's normal keyboard.
- input type="email"` displays the normal keyboard and '@' and '.com'.
- input type="tel"` displays the numeric 0 to 9 keypad.
- input type="number"` displays a keyboard with numbers and symbols.
- input type="date"` displays the mobile device's date selector.
- input type="datetime"` displays the mobile device's date and time selector.
- input type="month"` displays the mobile device's month and year selector.

Let users modify location field: Many websites auto-detect user location and use this information to then provide relevant content. It's essential to let users alter the location because in some cases users might want to see results for a different place.

Strive to create a consistent experience

Consistency is one of the key pillars of user experience. Consistent design is user-friendly design – by focusing on creating consistent design, you create more intuitive design. Always strive to make the website both internally and externally consistent.

Internal consistency: Create a consistent library of design assets and use it for all pages of your website. Fonts, buttons, links, icons and all other UI elements need to be consistent across the website to keep visual consistency.

External consistency: Make sure the website you design looks like part of a larger product family. For example, if you have a mobile app, your mobile website should convey a sense of familiarity for users who use it.

Build your best mobile site

All points mentioned here can be considered industry best practices. But just because something is called a 'best practice' doesn't mean it is the optimal solution for your website. That's why it's always important to test your design decisions. Make usability testing a mandatory part of your design process and enhance the experience on a regular basis.

RESOURCES

Mobile-Friendly Test by Google

Check if your website is responsive by taking Google's mobile-friendly test.
https://search.google.com/test/mobile-friendly

PageSpeed Insights

Create a report that can be useful for setting your performance targets.
https://developers.google.com/speed/pagespeed/insights/

Real User Experience Test (rUXt)

Test how your site performs against competitors.
https://ruxt.dexecure.com/compare

Responsive Image Breakpoints Generator

Generate the optimal responsive image dimensions.
https://www.responsivebreakpoints.com/

Lazy Loading Images and Videos

Tutorial from Google on how to implement lazy loading for your website.
https://developers.google.com/web/fundamentals/performance/lazy-loading-guidance/images-and-video/

Web Accessibility Checklist

A handy guide to getting started with web accessibility.
https://a11yproject.com/checklist.html

CRACK CODE

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Loading large amounts of JavaScript can heavily impact the speed of your site. Discover how code splitting can 'split' JS into 'pieces' that load as the user needs them

SPLITTING

Modern sites often combine all of their JavaScript into a single, large main.js script. This regularly contains the scripts for all your pages or routes, even if users only need a small portion for the page they're viewing. When JavaScript is served this way, the loading performance of your web pages can suffer – especially on mobile devices. So let's fix it by implementing JavaScript code splitting.

What problem does code splitting solve?

When a web browser sees a <script> it needs to spend time downloading and processing the JavaScript you're referencing. This can feel fast on high-end devices but loading, parsing and executing unused JavaScript code can take a while on average mobile devices with a slower network and slower CPU. If you've ever had to log on to coffee-shop or hotel WiFi, you know slow

network experiences can happen to everyone.

Each second spent waiting on JavaScript to finish booting up can delay how soon users are able to interact with your experience. This is particularly the case if your UX relies on JS for critical components or even just attaching event handlers for simple pieces of UI.

Do I need to bother with code splitting?

It is definitely worth asking yourself whether you need to code-split. If your site requires JavaScript for interactive content (for features like menu drawers and carousels) or is a single-page application relying on JavaScript frameworks to render UI, the answer is likely 'yes'. Whether code splitting is worthwhile for your site is a question you'll need to answer yourself. You understand your architecture and how your site loads best. Thankfully there are tools available to help you here.

Get help

For those new to JavaScript code splitting, Lighthouse (*https://netm.ag/2Tq1nJ1*) – the Audits panel in Chrome Developer Tools – can help shine a light on whether this is a problem for your site.

The audit you'll want to look for is Reduce JavaScript Execution Time (documented at *https://netm.ag/2B8sJfx*). This audit highlights all of the scripts on your page that can delay a user interacting with it.

PageSpeed Insights (*https://developers.google.com/speed/pagespeed/insights/*) is an online tool that can also highlight your site's performance – and includes lab data from Lighthouse and real-world data on your site performance from the Chrome User Experience Report.

> "Each second spent waiting on JavaScript to finish booting up can delay how soon users can interact"

Code coverage in Chrome Developer Tools

If it looks like you have costly scripts that could be better split, the next tool to look at is the Code Coverage feature in the Chrome Developer Tools (DevTools>top-right menu>More tools> Coverage). This measures how much unused JavaScript (and CSS) is in your page. For each script summarised, DevTools will show the 'unused bytes'. This is code you can consider splitting out and lazy-loading when the user needs it.

The different kinds of code splitting

There are a few different approaches you can take when it comes to code splitting JavaScript. How much these apply to your site tends to vary depending on whether you wish to split up page/application 'logic' or split up libraries/frameworks from other 'vendors'.

Dynamic code splitting: Many of us 'statically' import JavaScript modules and dependencies so that they are bundled together into one file at build time. 'Dynamic' code splitting adds the ability to define points in your JavaScript that you would like to split and lazy-load as needed. Modern JavaScript uses the dynamic `import()` statement to achieve this. We'll cover this more shortly.

Vendor code splitting: The frameworks and libraries you rely on (eg React, Angular, Vue or Lodash) are unlikely to change in the scripts you send down to your users, often as the 'logic' for your site. To reduce the negative impact of cache invalidation for users returning to your site, you

Above This shows how much longer parsing and compiling can take on a mobile device versus a desktop or laptop with a more powerful processor

Above The JavaScript execution time audit in Lighthouse illustrating scripts responsible for excessive processing activity

Case study

Twitter Lite

Paul Armstrong

Tech lead for mobile web experience

"Creating a fast web application (like Twitter Lite) involves many cycles of measuring where time is wasted, understanding why it's happening and applying potential solutions. Unfortunately, there's never just one quick fix. Performance is a continuous game of watching and measuring for areas to improve.

With Twitter Lite, we made small improvements across many areas: including initial load times, React component rendering (and prevention re-rendering), image loading and much more. Most changes tend to be small but they add up and the end result is that we have one of the largest and fastest progressive web applications.

Loading a single or even just a few very large JavaScript files in order to run a site is a huge bottleneck for mobile users to see and interact with a website. Our original setup (for Twitter Lite) took over 5 seconds to load our main bundle, while after splitting out code by routes and common chunks, it takes barely 3 seconds (on a simulated 3G network). This was done early on in our performance focus sprints but this single change made a huge difference when running Google's Lighthouse web application auditing tool.

Overall, this is a list of just some of the many improvements that we've made over time to Twitter Lite. There are certainly more to come and we hope to continue sharing the problems we find and the ways that we work to overcome them."

Above When developing Twitter Lite, the company made a series of small improvements across many areas: including initial load times, React component rendering, image loading and much more

Coverage × | Request blocking | Console | What's New | Search

URL filter | Content scripts

URL	Type	Total Bytes	Unused Bytes	
https://ass… /client.ac8d99f1.js	JS	1 756 224	1 090 939	62.1 %
https://as…/vendor.1e1946dd.js	JS	1 078 064	533 384	49.5 %
/1.fcac577b101016b738c9.song	JS	394 555	295 381	74.9 %
https://a…/content.624854bb.js	JS	293 724	211 026	71.8 %
/vendors~product-grid~red-card	JS	165 318	165 256	100.0 %
/260785567427852?v=2.8.37&r=	JS	185 269	147 173	79.4 %

3.0 MB of 5.1 MB bytes are not used. (59%)

Above The code coverage panel in DevTools showing how much of the packaged JavaScript is used on the current page

can split your 'vendors' into a separate script.

Entry-point code splitting: Entries are starting points in your site or app that a tool like Webpack can look at to build up your dependency tree. Splitting by entries is useful for pages where client-side routing is not used or you are relying on a combination of server and client-side rendering.

For our purposes in this article, we'll be concentrating on dynamic code splitting.

Get hands on with code splitting

Let's optimise the JavaScript performance of a simple application that sorts three numbers (*https://code-splitting-starter.glitch.me/*) through code splitting – this is an app by my colleague Houssein Djirdeh. The workflow we'll be using to make our JavaScript load quickly is measure, optimise and monitor. Start here: *https://bit.ly/netmag-codesplitting*.

Measure

Before attempting to add any optimisations, we're first going to measure the performance of our JavaScript. As the magic sorter app is hosted on Glitch, we'll be using its coding environment. Here's how to go about it:

- Click the Show Live button.
- Open the DevTools by pressing CMD+OPTION+i / CTRL+SHIFT +i.
- Select the Network panel.
- Make sure Disable Cache is checked and reload the app.

This simple application seems to be using 71.2 KB of JavaScript just to sort through a few numbers. That certainly doesn't seem right. In our source `src/index.js`, the Lodash utility library is imported and we use `sortBy` – one of its sorting utilities – in order to sort our numbers. Lodash offers several useful functions but the app only uses a single method from it. It's a common mistake to install and import all of a third-party dependency when in actual fact you only need to use a small part of it.

Optimise

There are a few options available for trimming our JavaScript bundle size:

1. Write a custom sort method instead of relying on a third-party library.
2. Use `Array.prototype.sort()`, which is built into the browser.
3. Only import the `sortBy` method ▶

from Lodash instead of the whole library.

4. Only download the code for sorting when a user needs it (when they click a button).

Options 1 and 2 are appropriate for reducing our bundle size – these probably make sense for a real application. For teaching purposes, we're going to try something different. Options 3 and 4 help improve the performance of the application.

Only import the code you need

We'll modify a few files to only import the single `sortBy` method we need from Lodash. Let's start with replacing our `lodash` dependency in `package.json`:

```
"lodash": "^4.7.0",
```

with this:

```
"lodash.sortby": "^4.7.0",
```

In `src/index.js`, we'll import this more specific module:

```
js
import "./style.css";
import _ from "lodash";
import sortBy from "lodash.sortby";
```

Next, we'll update how the values get sorted:

```
js
form.addEventListener("submit", e
=> {
  e.preventDefault();
  const values = [input1.
valueAsNumber, input2.
valueAsNumber, input3.
valueAsNumber];
  const sortedValues =
_.sortBy(values);
  const sortedValues =
sortBy(values);
  results.innerHTML = `
  <h2>
    ${sortedValues}
  </h2>
  `
});
```

Reload the magic numbers app, open up Developer Tools and look at the Network panel again. For this specific app, our bundle size was reduced by a scale of four with little work. But there's still much room for improvement.

JavaScript code splitting

Webpack is one of the most popular JavaScript module bundlers used by web developers today. It 'bundles' (combines) all your JavaScript modules and other assets into static files web browsers can read.

The single bundle in this application can be split into two separate scripts:

- One is responsible for code making up the initial route.
- Another one contains our sorting code.

Using dynamic imports (with the `import()` keyword), a second script can be lazy-loaded on demand. In our magic numbers app, the code making up the script can be loaded as needed when the user clicks the button. We begin by removing the top-level import for the sort method in `src/index.js`:

```
import sortBy from "lodash.sortby";
```

Import it within the event listener that fires when the button is clicked:

```
form.addEventListener("submit", e
=> {
  e.preventDefault();
  import('lodash.sortby')
    .then(module => module.default)
```

Case study

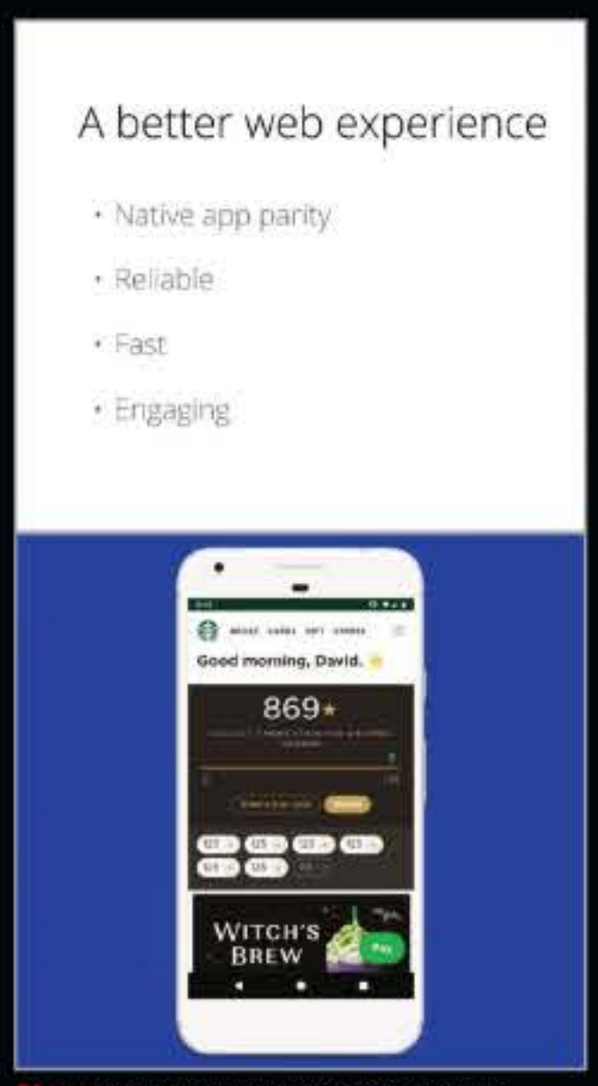
Starbucks

David Brunelle

Director of product engineering

"At Starbucks, customers need our progressive web app (PWA) to be fast. No one wants to be standing in front of their barista, waiting for their app to load while a line forms behind them. We use JavaScript code splitting with Webpack to keep our JavaScript bundles small. This means our customers' devices don't need to download or parse unnecessary code. This and other techniques helps ensure our PWA was two times faster at getting interactive than the web experience it replaced.

We use the service worker API and Workbox pre-cache to download additional JavaScript and CSS bundles, before the user needs them. Our CDN dynamically optimises images, so that we're serving the best formats and sizes at the right time. We built our PWA to be mobile first. But because we built it to be responsive, it provides a great experience on desktop too!"



Above Starbucks uses code splitting to keep bundles small and because it works fast, customers aren't kept waiting for it to load while a queue of angry customers forms behind them

```
  .then(sortInput())
  .catch(err => { alert(err) });
});
```

This dynamic import() feature we're using is part of a standards-track proposal for including the ability to dynamically import a module in the JavaScript language standard. Webpack already supports this syntax. You can read more about how dynamic imports work in this article: *https://netm.ag/2GonvGJ.*

The import() statement returns a Promise when it resolves. Webpack considers this as a split point that it will break out into a separate script (or chunk). Once the module is returned, the module.default is used to reference the default export provided by lodash. The Promise is chained with another .then() calling a sortInput method to sort the three input values. At the end of the Promise chain, .catch() is called upon to handle where the Promise is rejected as the result of an error.

In a real production applications, you should handle dynamic import errors appropriately. Simple alert messages (similar to what is used here) are what are used and may not provide the best user experience for letting users know something has gone wrong.

In case you see a linting error like "Parsing error: import and export may only appear at the top level", know that this is due to the dynamic import syntax not yet being finalised. Although Webpack support it, the settings for ESLint (a JavaScript linting tool) used by Glitch have not been updated to include this syntax yet but it does still work.

The last thing we need to do is write the sortInput method at the end of our file. This has to be a function returning a function that takes in the imported method from lodash.sortBy. The nested function can sort the three input values and update the DOM:

```
const sortInput = () => {
 return (sortBy) => {
  const values = [
   input1.valueAsNumber,
   input2.valueAsNumber,
   input3.valueAsNumber
  ];
  const sortedValues =
sortBy(values);
  results.innerHTML = `
   <h2>
    ${sortedValues}
   </h2>
  `
 };
}
```

> JavaScript code splitting and lazy-loading is useful for trimming the bundle size of your app or site

Monitor

Now let's reload the application one last time and keep a close eye on the Network panel. You should notice how only a small initial bundle is downloaded when the app loads. After the button is clicked to sort the input numbers, the script/chunk containing the sorting code gets fetched and executed. Do you see how the numbers still get sorted as we would expect them to?

JavaScript code splitting and lazy-loading can be very useful for trimming down the initial bundle size of your app or site. This can directly result in faster page load times for users. Although we've looked at adding code splitting to a vanilla JavaScript application, you can also apply it to apps built with libraries or frameworks.

Lazy-loading with a JavaScript library or framework

A lot of popular frameworks support adding code splitting and lazy-loading using dynamic imports and Webpack.

Here's how you might lazy-load a movie 'description' component using React (with React.lazy() and their Suspense feature) to provide a "Loading..." fallback while the component is being lazy-loaded in (see *https://hswolff.com/blog/react-lazy-and-suspense/* for some more details):

```
import React, { Suspense } from
'react';
const Description = React.lazy(() =>
import('./Description'));
function App() {
 return (
  <div>
   <h1>My Movie</h1>
   <Suspense fallback="Loading...">
    <Description />
   </Suspense>
  </div>
 );
}
```

Code splitting can help reduce the impact of JavaScript on your user-experience. Definitely consider it if you have larger JavaScript bundles and when in doubt, don't forget to measure, optimise and monitor.

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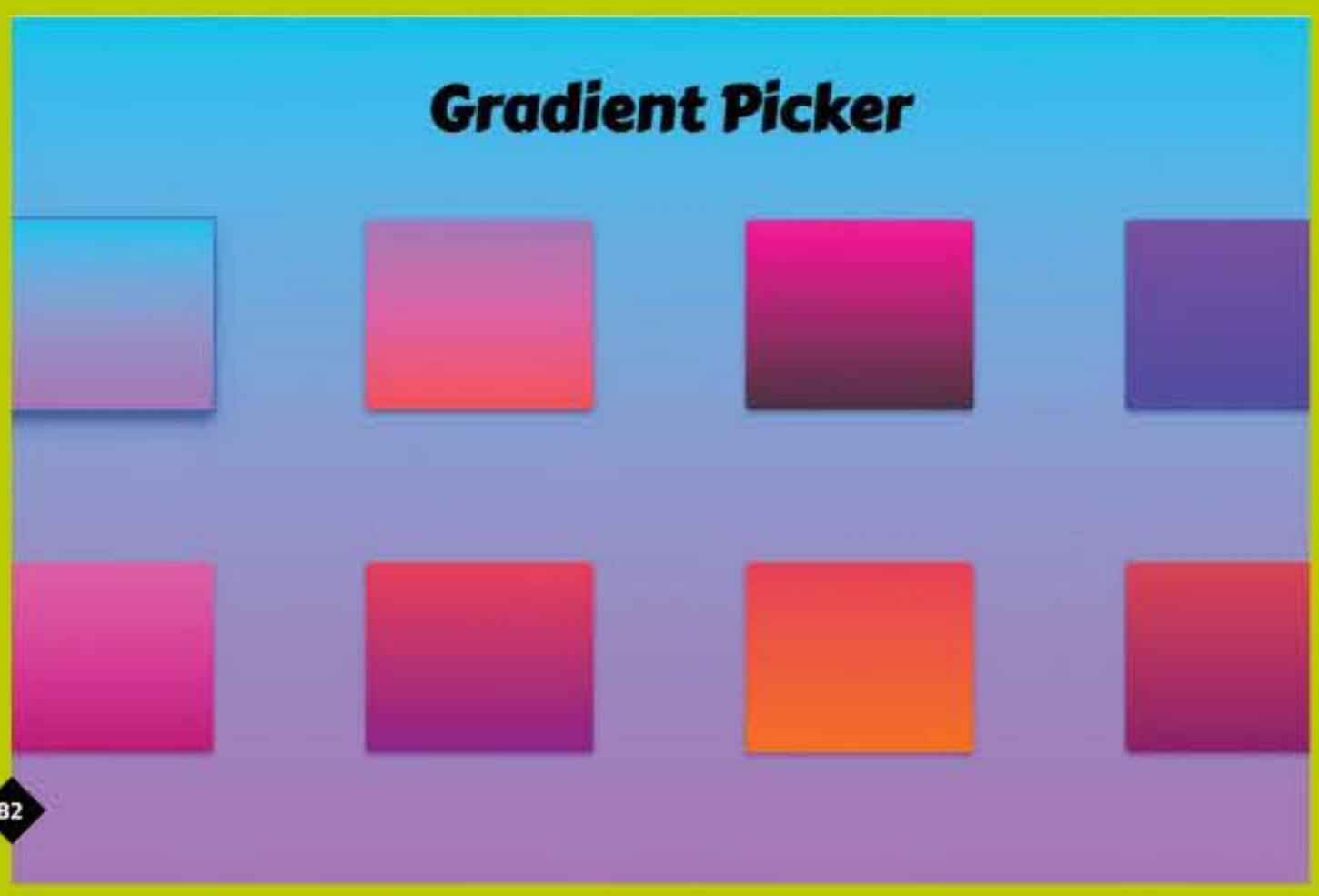

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Access source files here!

All the files you need for this tutorial can be downloaded at https://netm.gg/2Uljgnl9

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* UNITY

UTILISE UNITY FOR WEBGL DEVELOPMENT

Richard Mattka shows you how to develop in WebGL using Unity and create an animated landing page with interaction and light effects

Unity is one of the world's leading creation platforms for real-time rendering. It is primarily used for game development but more recently it has been harnessed for animation, film, visual effects, app creation and a wide range of real-time experiences. Unity excels in VR, AR and mixed reality experience development as well. What's more, it also supports networking for collaborative game development.

One of the biggest advantages to using Unity for development is the 'build once, deploy many' approach. So those that master the skills of game or film development in Unity can export much of what they create to gaming consoles, mobile devices and the web. In fact, there over 25 supported platforms to target from Unity.

WEB DEVELOPMENT WITH WEBGL

WebGL enables real-time rendering of complex 3D and 2D scenes and animations in the web browser. That means you get the power of GPU-accelerated experiences with the worldwide reach of the internet via the browser.

WHAT IS UNITY WEBGL?

Building for WebGL from Unity publishes your scenes and C# code as JavaScript using HTML5 technologies along with the WebGL rendering API. This enables your project to run in a web browser. An interface class also enables communication between JavaScript and the WebGL app.

PLATFORM SUPPORT

When it comes to browser support, Unity states that: "Unity WebGL is supported by the current versions of most major browsers on the desktop, however there are differences in the level of support offered by the different browsers".

The biggest consideration right now is that mobile devices are not fully supported by Unity WebGL. This means if you need to deploy to mobile, you'll want to target native builds for those devices.

FEATURES NOT SUPPORTED:

WebGL builds are not able to support all features typically supported in most native builds. These are platform constraints and include:

- JavaScript does not currently support multi-threading, so threads are not supported.
- The WebGL graphics API is equivalent to OpenGL ES 2.0 and 3.0, which has some limitations.
- You can't debug WebGL builds in Visual Studio. Once the build is done, you'll have to rely on other techniques and script logging to troubleshoot bugs.
- You'll need to use alternatives to networking rather than direct IP access, since browsers do not allow direct access to IP sockets for networking.
- Web Audio API is used for WebGL builds, instead of the more robust audio system in native builds. So there will be some limitations to audio that you may need to consider.

TIME TO GET STARTED WITH UNITY AND WEBGL

In this tutorial, you will create a simple Unity project that will serve as a landing page for a web site. You will build a scene, work with a 3D perspective camera, add 3D objects and text elements. You'll work with lights and animation. You'll build the project and export it for WebGL. You'll be able to open and run your new site in a web browser and you'll also learn to make it responsive so it scales with your browser size.

STEP 1: DOWNLOAD AND INSTALL UNITY

To get started, you'll need to download and install the Unity development tools. This will include Visual Studio for editing your C# code. Unity is available for free here: *https://unity3d.com/*

STEP 2: CREATE A NEW PROJECT

Open up Unity and create a new project. Call it anything you like but be sure to save it somewhere you can easily find or, ideally, inside your local web server to make it easier to run when you build it.

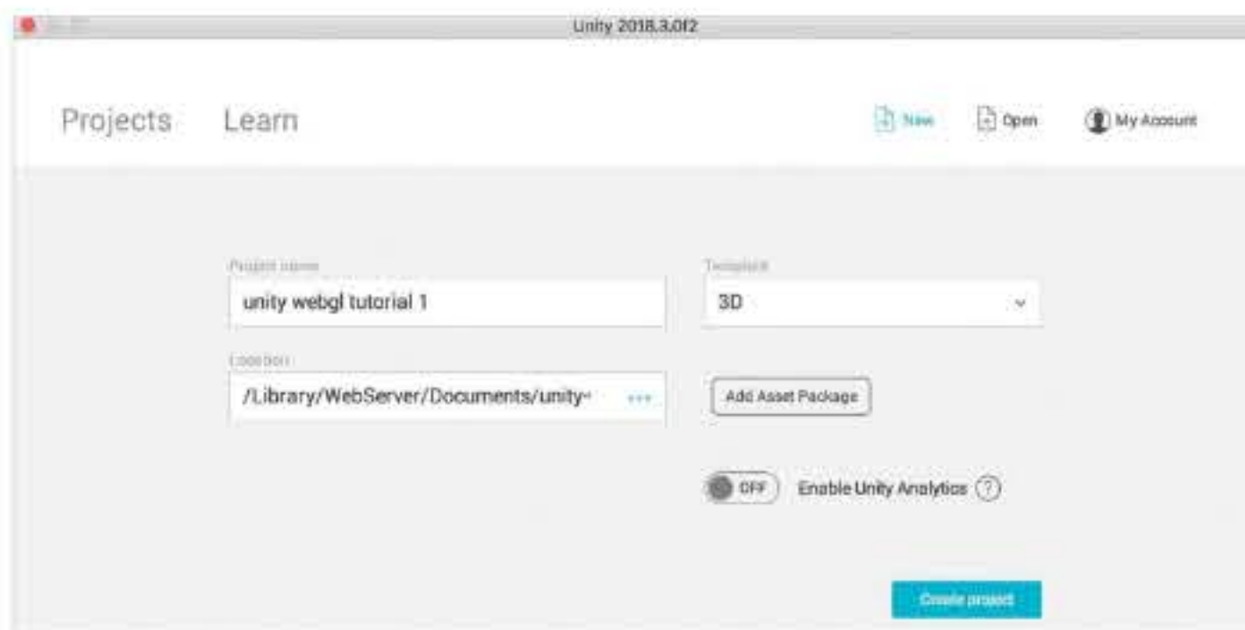
STEP 3: SET UP DEFAULT SETTINGS

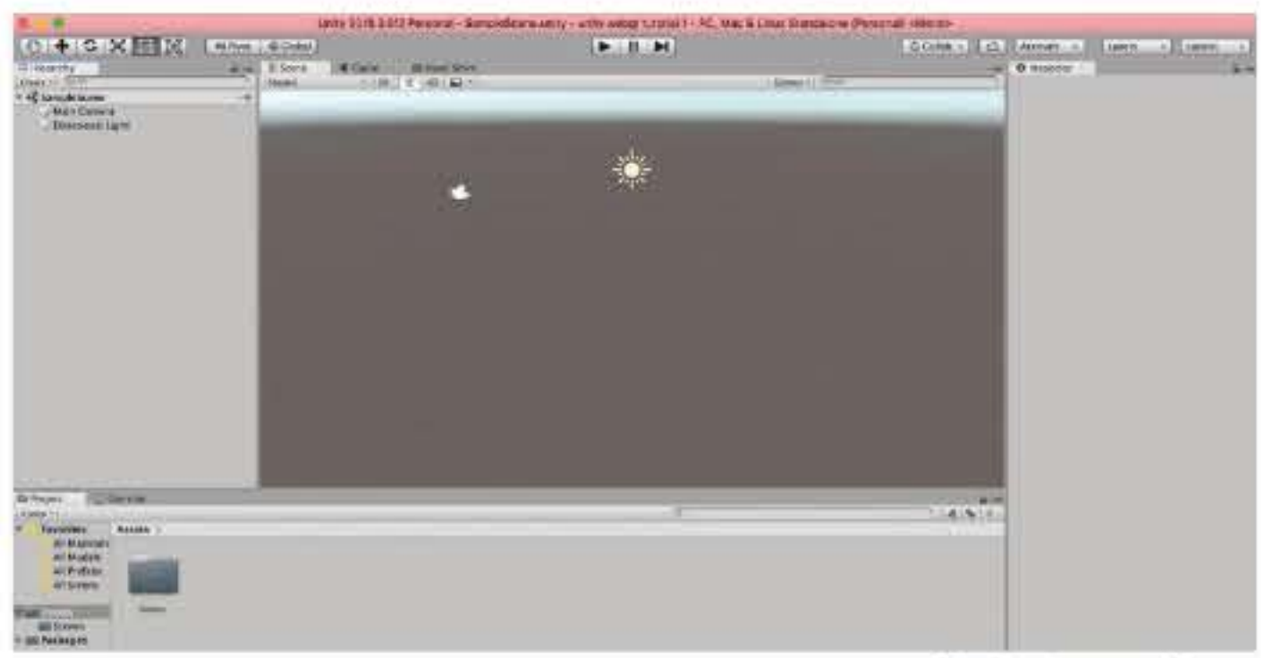
Once created, Unity will open up your default project. Under the Game tab, select the 16:9 ratio for rendering and uncheck the box enabling low resolution. On the Scene tab, make sure that 2D is not selected so it is rendered in 3D.

STEP 4: UPDATE CAMERA AND BACKGROUND

In the scene that Unity creates by default, you'll already have a camera and a light included. Let's set about tweaking the camera settings for our landing page scene.

Click on the camera in the scene explorer window or in the scene itself to make it active. Make sure the camera position is at 0,0,-10 and be sure there is no rotation on the camera. Then on the camera's properties, select the Background colour by clicking on that option. Change the colour from the default blue to black. Also change the Clear Flags setting to Solid Color instead of the default Skybox. The camera preview and game view should now show a solid black screen.





Top Setting up your first Unity project

Above The default Unity scene with camera and light

STEP 5: ADD A TEXT ELEMENT

Right-click or use the menus to add a new UI>TextMesh Pro element. This will prompt you to install TextMesh Pro if you don't have it already. You don't need to import the example files; the standard set is all you need. This will add a new canvas element to your scene, with a default text element.

Click on the canvas element and change the render mode property in the inspector to World Space instead of the default Screen Space. This will enable your text elements to be seen by the camera in 3D space, instead of fixed to the camera as 2D UI/HUD style elements. ▶

Set the canvas width to 16 and the height to 9 and push the canvas back in Z space to -7.34 so the Text Transform position values read 0,0,-7.34. This will set the canvas to be the same dimensions as our target resolution and position it so the camera can see it.

Click on the text element that is a child of the canvas element. You can rename this to something more meaningful if you wish, like Alliance Text. Change the Pos Y to -72, the Pos Z to be 185.6, the width to 400 and the height to 200. Next, update the text to read ALLIANCE or some other title you like. Set the font size to 24 and set the Spacing Options> Characters to be 60 to give some spacing between the letters.

Go to the Face Dilate option and set that to -.35. This will give a cool thin shaded look to the characters for a quick logo style.

STEP 6: ADD SUBTITLE TEXT

Right-click or select the option to create a new UI>TextMesh Pro element from the menu. This will add the new TextMesh Pro text element under the existing canvas element. Set its Pos Y to -27 and the Pos Z to be 100. Make the font much smaller, say around 6, and make it bold. This text and the first title should both be centred, using the alignment options. Update your text to read FILMS or something similar.

Adjust the two titles to the size and look that you like. You can preview in the game window as you work or by playing the scene via the large play icon.

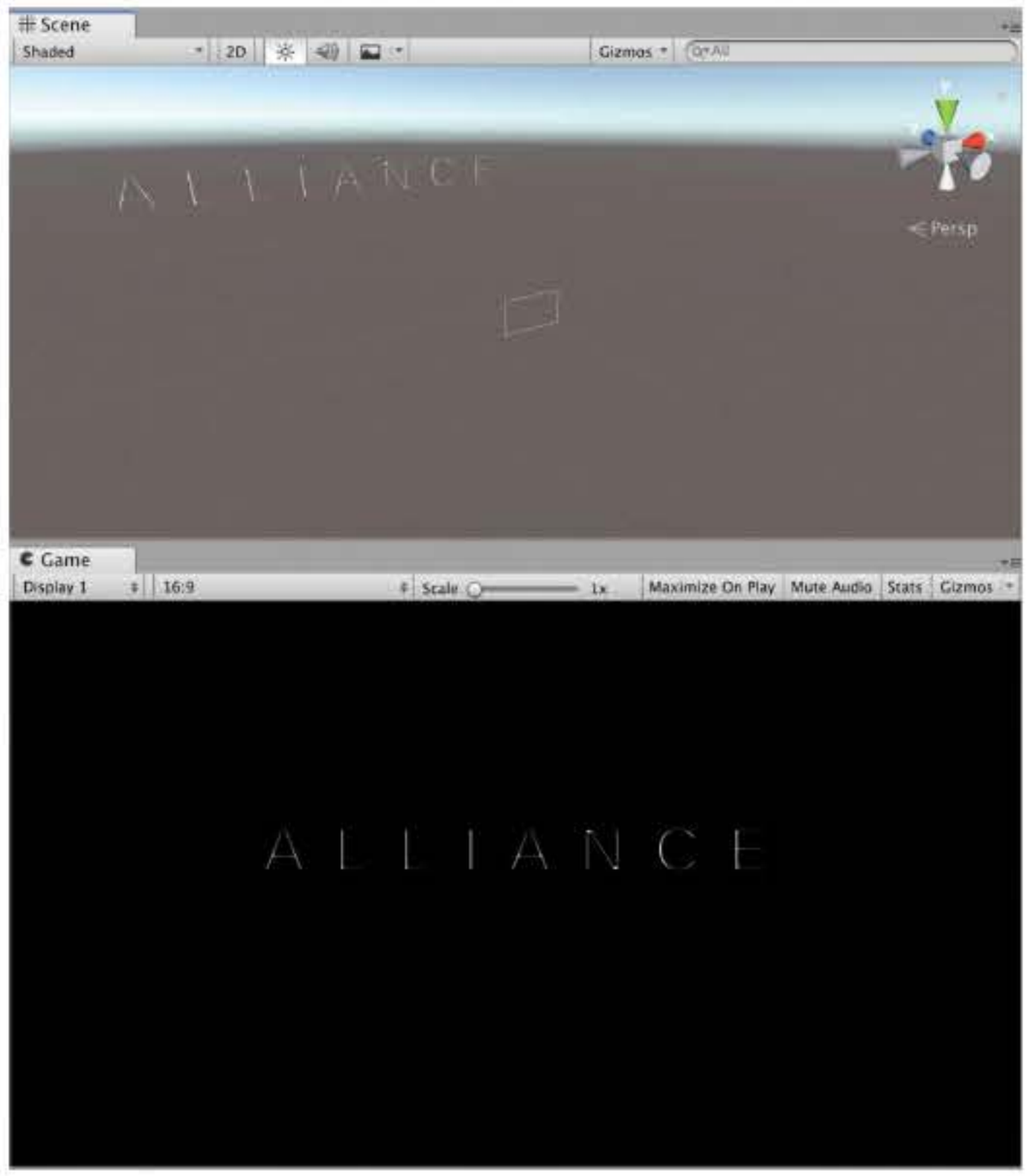
STEP 7: CREATE A CUBE

Next, add an object to the scene and position it between the two text layers. From the GameObject window, select 3D Object>Cube. This will place a cube in your scene. Use the 3D view to position your cube; it should be about Position Z of 120 with x and y at 0 to remain centred. Give the cube some rotation so you can see it better and then scale it up to about 30 for x, y and z.

STEP 8: APPLY A MATERIAL TO THE CUBE

We'll now make the cube black like some impressive monolith. Go to the Assets menu, then Create>Material. This will add a new material object to your assets folder. Click on it and change the colour to black. The Color option is in the inspector panel and shows the current white colour. Click on the colour to change it, which will open a colour picker tool. Increase the metallic property to .7 to give a reflective shine when the lights hit it. You can increase the smoothness as well to around .85.

Drag this material right onto the cube object and you'll see the colour update to black.



Above Working in both the scene 3D explorer and the Game view to position the text elements

STEP 9: MORE LIGHTS

Add a new directional light to the scene from the GameObject>Light menu. Set the colour of the light in the inspector to a blue shade. Then play with the rotation of the light to get an angle you like that bounces off the cube.

Also go back and adjust the default light that was included with the initial scene to a red shade. Rotate this one too, until you get a cool effect from the red and blue lights bouncing off the cube.

STEP 10: ROTATE THE CUBE

Next, you're going to add a simple script to make the cube rotate. Click on the cube object in your scene. In the inspector panel, down at the bottom, click the Add Component button. Scroll down to the New Script option and select it. Name the new script 'rotate' and add it; you'll see the component added to your object. Double-click it to edit the script – it will open up Visual Studio to edit the script.

Don't worry if you're new to C# (the programming language used in Unity). All you need to do is update the default code in the editor to the following:

```
using System.Collections;
```

```
using System.Collections.Generic;
using UnityEngine;
public class rotate : MonoBehaviour
{
  public float speed = 0.1f;
  void Start()
  {
  }
  void Update()
  {
    transform.Rotate(new Vector3(-speed, speed,
-speed));
  }
}
}
```

So what are we doing here? First, you're adding a variable for the rotation speed at the top of the class. Then, inside the Update function, you are incrementing the rotation of the object by that speed. The Update function runs every render frame, much like animation frames in JavaScript.

Now when you play the scene, you should see your cube spinning!

> "Those that master the skills of game or film development in Unity can export to gaming consoles, mobile devices and the web"

STEP 11: EXPORT YOUR SCENE

You now have a simple splash scene that could work as a splash page for a web site. It's really simple and not yet interactive but has taught you how the process works. With a few upgrades it could be very usable. For example, you could add more elements, import some FBX objects, animate those, add more lights and create something really cool. You could apply the rotate script to other elements and create some eye-catching effects quickly.

Back to exporting: from the File menu select Build Settings, then select WebGL as the target platform. Click on Switch Platform at the bottom of the window; this will load the required scripts for exporting to WebGL. Click on Add Open Scenes to add the scene to the Scenes in Build window.

Next, click on Player Settings... to open that inspector window. Click on the HTML5 icon on the tabs and set the width to 1920 and the height to 1080. Also select the Minimal WebGL Template theme. You can add your own themes to Unity as ▶

★ RESOURCES

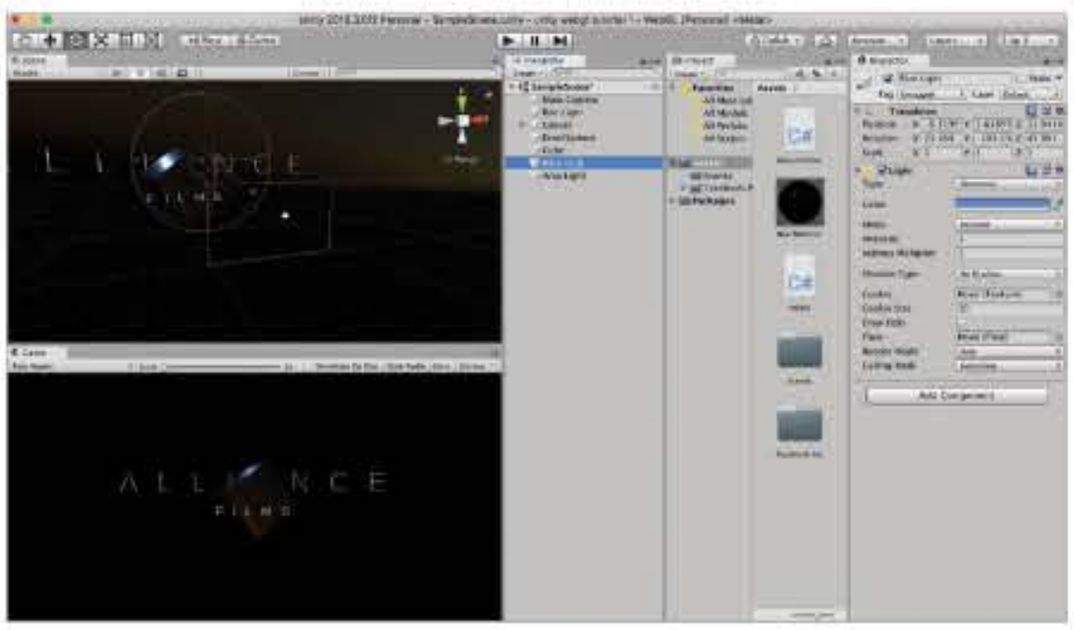
Essential resources

Unity User Manual
https://docs.unity3d.com/Manual/index.html
The Unity User Manual includes detailed documents on every aspect of the user interface, tools and platforms. The detailed scripting API contains syntax and examples for virtually every function and command you can think of in the Unity C# language. Integration in the scripting environment (Visual Studio) makes jumping into the docs seamless.

Unity Tutorials
https://unity3d.com/learn/tutorials
These video tutorials are an indispensable resource for getting started with Unity. Whether jumping into game dev or building out a site concept to export to WebGL, there are plenty of tips and tricks here to make learning quick. Step-by-step examples walk through almost every aspect of the process.

Unity Developer Forums
https://forum.unity.com/
Unity has an enormous developer community, so one of the best resources to tap, once you've explored the docs and tutorials, is the forums.

WebGL integration
https://docs.unity3d.com/Manual/webgl-interactingwithbrowserscripting.html
Once you master the basics, Unity also includes an interface for communicating between JavaScript running on your page and WebGL instance. This enables you to fit Unity WebGL in as you need, as a complete solution or a single piece to a larger web-based application.



Above Working with light colouring, position and rotation in 3D view

★ CASE STUDIES

FIND YOUR INSPIRATION

Book of the Dead

https://unity3d.com/book-of-the-dead

Book of the Dead is built on the new High-Definition Render Pipeline to showcase what is possible using the new Scriptable Render Pipeline, which provides enhanced customisation of Unity's rendering architecture.

Ghost of a Tale

https://www.ghostofatale.com/

Winner of the 2018 Best 3D Visuals award from Unity, this beautiful interactive experience demonstrates how powerful Unity rendering is. Explore a dense and realistic world, stunning effects and motion.

Baymax Dreams

https://unity.com/madewith/baymax-dreams

Unity is so advanced in terms of final render quality it is now being used in film and animations as well. Check out the Baymax Dreams short films to see just how rapidly this technology is evolving. Inspired by Disney Television Animation's *Big Hero 6: The Series* TV show, Baymax Dreams explores the content of "Baymax's dreams, whether he's counting electric sheep or dodging virtual bedbugs". Director Simon J Smith (*Penguins of Madagascar, Bee Movie*) led the creative charge.

well and customise them. For now the default one is absolutely fine.

Now press Build, give the project a name if needed and wait for the build to finish.

STEP 12: UPDATE HTML STYLES

Unity will create an index.html file for you and the supporting files and folders for your web page. The code of the html file is based on the template file you chose when building the project. You can create new ones, download others made by other devs or modify the default ones.

For now, simply open the index.html file that was generated: you need to make a simple adjustment to the CSS to make it responsive and fill the browser window. Remove inline style from default div with the id gameContainer. Next, add these new styles to the html head like this:

```
<style>
    html,body { width:100%; height: 100%; overflow:
hidden; padding:0; margin: 0;}
    #gameContainer { width:100%; height: 100%; }
    canvas { width:100%; height: 100%; }
</style>
```

Now when you navigate to the index.html page in your browser, you will see the web app fill the screen and responsively resize as your browser is resized.

Note: You should be running a local web server or push the build to a web server when running your web sites and applications.

ADD INTERACTIVITY

Now that you've set it up in 3D, one of the easiest things to add to your application is some camera motion. It's a great effect to add to any page. A subtle camera pan or tilt that follows the mouse makes the page pop immediately, showing off the 3D goodness without being overwhelming.

Similar to before, you need to create a C# script and attach it to your camera. Select the camera and click the Add Component button at the bottom of the inspector. Select the New Script options and call it MouseFollow. Now double-click the script to open it for editing. Add the following code:

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class MouseFollow : MonoBehaviour
{
  public float horzScale = 10.0f;
```

```
  public float vertScale = 1.0f;

  void Update()
  {

    float halfWidth = Screen.width / 2.0f;
    float halfHeight = Screen.height / 2.0f;
    float rotY = (Input.mousePosition.x - halfWidth) /
halfWidth;
    float rotX = (Input.mousePosition.y - halfHeight) /
halfHeight;
    transform.rotation = Quaternion.Euler(rotX *
vertScale, rotY * horzScale, 0.0f);
  }
}
```

"A subtle camera pan or tilt that follows the mouse makes the page pop immediately, showing off the 3D goodness"

Essentially, what you are doing here is using the current mouse position, which is updated every render frame. You normalise the mouse position, using the typical method of dividing through by the screen resolution. We also use half resolution to ensure that the mouse values range from -1 to 1. This will give us the range we want for rotating the camera, where centred is zero, left is -1 and right is 1. The exact same approach is used for vertical tilting and these are applied to rotation values for the camera.

If you play your scene now, you'll see the camera moves with the mouse. You can tweak the horzScale and vertScales to suit your liking.

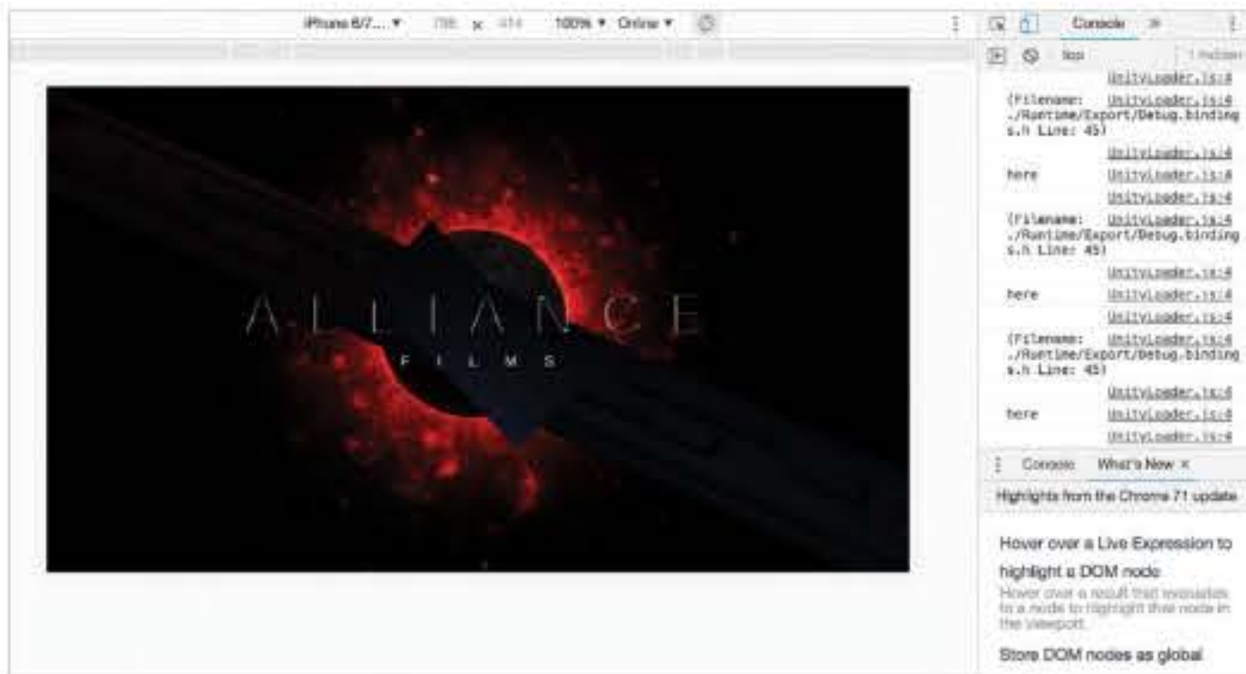
To see it in action in your webpage, you'll need to build the project again just as you did before. Be sure to make the same updates to the styles on the index.html page because that page will be overwritten with each build, until you create a new template to use for builds.

PARTING THOUGHTS

Unity is an incredibly powerful and accessible platform for a wide range of development. Historically, however, it has faced challenges when targeting WebGL as a platform. It is large in terms of file size, relative to lighter-weight 3D libraries such as Three.js. It also does not run effectively on all mobile browsers yet. It also has limitations that you'll simply have to handle in JavaScript.

That said, as improvements continue with WebGL exports, as device and browser power continue to increase, it becomes more and more viable to use Unity as a web-dev platform. As you delve into complex games or experiences, it becomes even more practical. Fast development with real-time views of scenes, animations and interactions is invaluable. Effects, shaders, sound integration, real-time physics all make it a powerful choice, depending on your application.

With the emergence of XR, VR and AR, developers traditionally working in 'web' technologies will find it essential to explore tools like Unity. Installations, apps, gaming and mixed reality experiences are only growing. I see more professional work emerging every day in these fields than in any other area of development. If you haven't done so already, now is the time to invest in learning Unity and similar development tools.



Top A final view of the Unity scene that is running in WebGL

Above Adding interactivity to the WebGL scene

View source files here!

All the files you need for this tutorial can be found at https://github.com/MattCrouch/emotion-v10-tutorial

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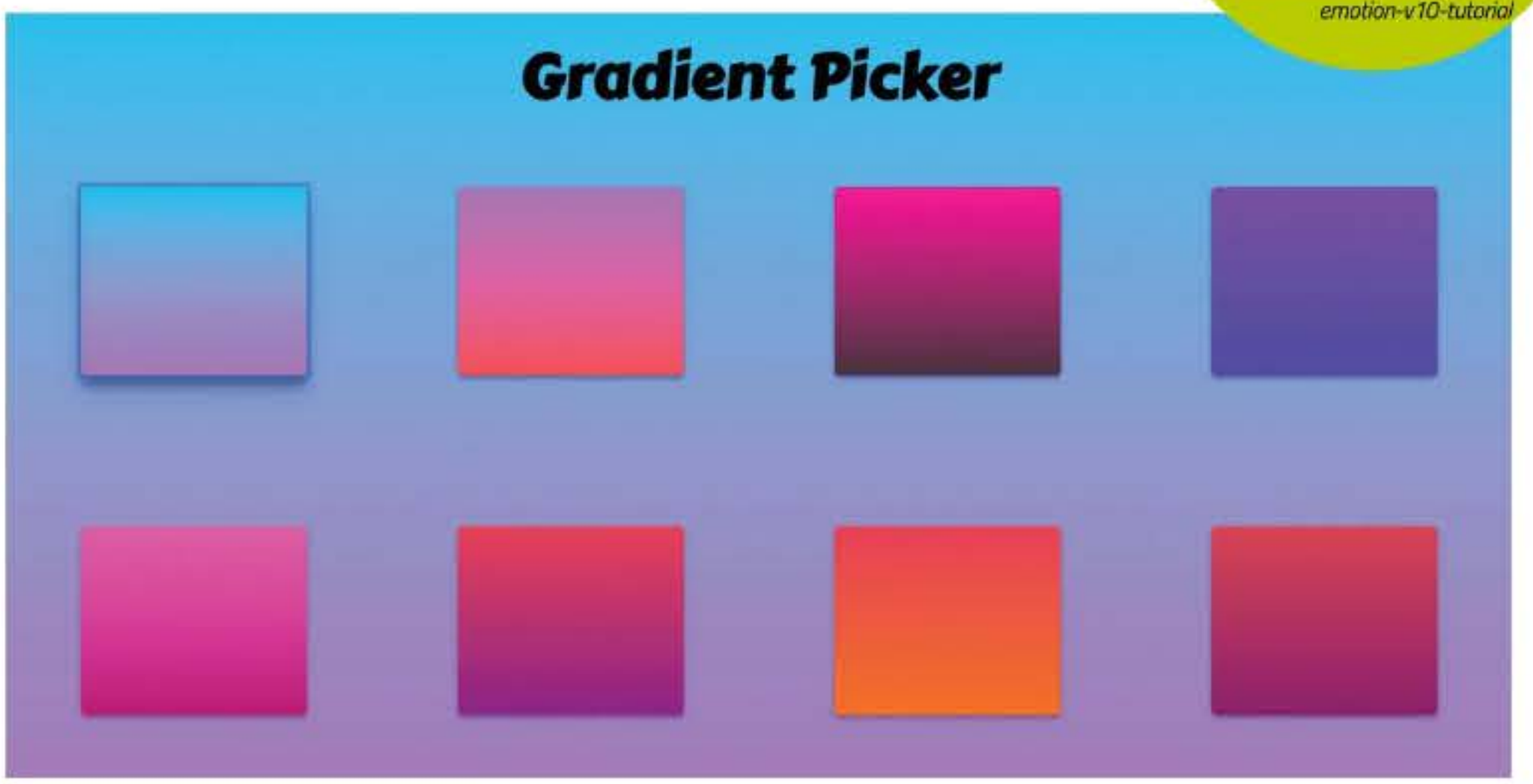
areas of expertise: React, TypeScript and application data management



* CSS-IN-JS

STYLE REACT COMPONENTS WITH EMOTION

Matt Crouch covers what's changed and how to use the latest version of the component styling framework

There have never been more options available to style a React application. CSS-in-JS libraries such as Styled Components, Radium and Fela all provide their own spin on conducting styles on a component level.

Emotion is another player in that space. Styles can be written as if they were in a CSS file or constructed using plain objects. This gives us the power to customise how each property is applied and under what circumstances.

The latest iteration, version 10, overhauls a number of areas. These include a new `<Global>` component for dynamic app-wide styling, improvements to the usage of the `css` prop and a raft of smaller features to help manage the look and feel of an application.

This tutorial walks through building a simple gradient-picking application with React. Whether you have never used Emotion before or are looking for what has changed in the latest update, there should be something new to learn. First things first, though, we need to install Emotion itself. As the project we are building started life from Create React App, we will use Yarn.

```
yarn add @emotion/core
```

While a lot of focus in version 10 is on the React side of things, Emotion still works in any environment. To split things out, the React-specific behaviour now lives inside the `@emotion/core` package.

The main `<App>` component will house most of the logic. Update it to use a fragment, which can be used to hold a few components without the need for a containing `<div>`. This also sets up the state for our gradient picker, which holds the ID of the gradient that was selected.

```
class App extends Component {
```

```
constructor() {
  super();
  this.state = {
    selected: gradients[0].id
  };
}
onClick(id) {
  this.setState({ selected: id });
}
render() {
  return (
    <React.Fragment>
      {/* Contents goes here */}
    </React.Fragment>
  )
}
}
```

Firstly, we need to lay down general styles to cover the whole application. These global styles would usually live outside of a CSS-in-JS library but Emotion provides a `<Global>` component that applies styles to the entire document instead of a component. Rather than generating a randomised class name, it passes the styles to a `css-global` style tag in the head of the document. This replaces the `injectGlobal` function from previous versions.

Open up `App.js` and import that component, plus a special function we need to apply styles to it.

```
import { Global, css } from "@emotion/core";
```

The `css` function accepts template literals to create styles. This enables us to write CSS with a familiar syntax. Emotion can then read and extract these styles, before processing and applying them wherever they are needed.

Using this function, create a set of global styles and have them stored in a `globalStyles` constant to use later. These styles generally reset browser defaults and provide a more consistent experience.

```
const globalStyles = css`
* {
  box-sizing: border-box;
}
html {
  background: #f5f6fa;
  font-family: Helvetica, Arial, sans-serif;
  font-size: 125%;
  line-height: 1.5;
}
body {
  margin: 0;
  padding: 0;
```

IN-DEPTH

BENEFITS OF CSS-IN-JS

With a CSS-in-JS approach, styles live alongside component logic. But isn't that what we've been told to avoid for years? As tooling has advanced, keeping them both together in component-powered environments can bring several benefits over what a separate imported stylesheet can provide.

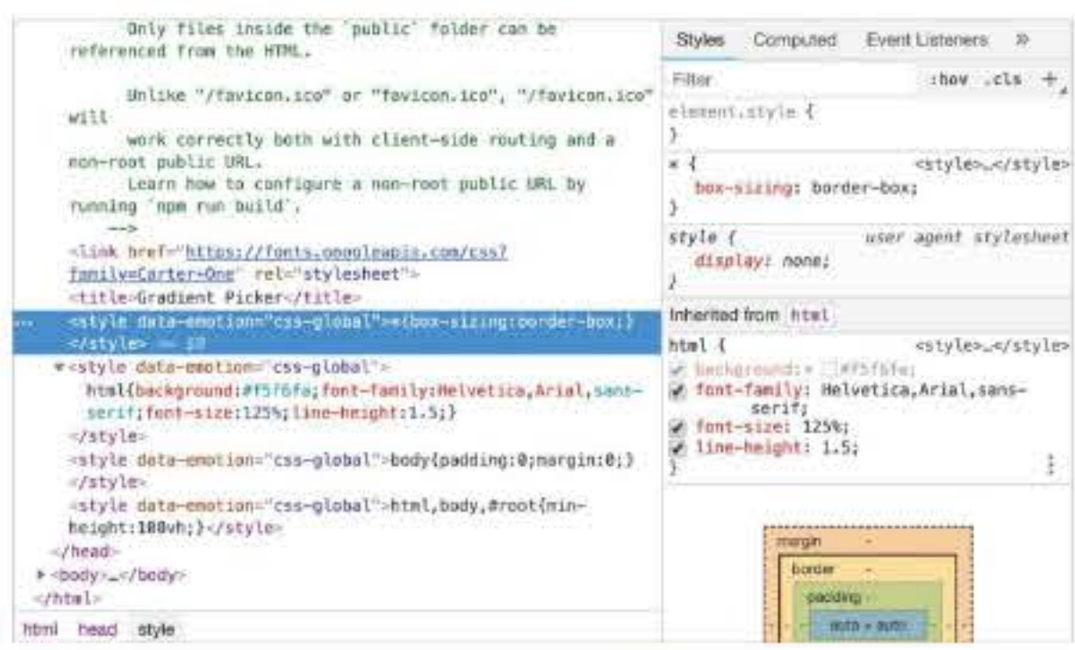
A common issue with stylesheets is the balance of specificity. New styles often get added to the bottom of the file, which can easily overwrite earlier styles if the selector is not specific enough. Depending on the order components are added to the project, they could end up being styled completely differently.

With CSS-in-JS libraries like Emotion, styles are imported as part of the component itself. They get given a randomised class name, which removes any issue with specificity.

Crucially, components become self-contained sections of interface, collocated with their styling. They can be dropped into any project without needing to worry about extra files or build processes, just the library that creates the styling.

React components often have styling based on the state they are in. With traditional approaches, such as BEM, a new class would be toggled for each state it can be in. CSS-in-JS libraries enable components to be styled on the fly based on their state using functions. As the component updates, the function can change the output without needing the right sets of class names. Functions can also be used to generate repeated rules, such as media queries.

Stylesheets still have their place and they aren't going anywhere any time soon. For component-based applications, a CSS-in-JS library such as Emotion can make developers' lives a lot easier.



Above All global styles are mounted directly into the `<head>` of the page. They can be identified by the `data-emotion="css-global"` attribute.

```
}
html, body, #root {
  min-height: 100vh;
};
```

To use the `<Global>` component, we add it to the render method, in-between the fragment tags we made earlier.

```
<React.Fragment>
  <Global styles={globalStyles} />
</React.Fragment>
```

We have a couple of options for styling at a component level. The first and most easily implemented way is through a special `css` prop on a component. Emotion detects this, creates classes and applies them to any component that can accept a `className` prop.

Emotion uses its own pragma function to convert JSX in order to catch this prop and perform the transformation. This can be configured either through Babel or by supplying a comment at the top of the file. As this project was created using Create React App, we don't have access to Babel, which means we need to use the comment instead.

Import the pragma function and tell Emotion to use it by applying the comment at the top of the file.

```
/** @jsx jsx */
import { jsx } from "@emotion/core";
```

We can use the same `css` function from earlier to create a grid using this method. The styles can be applied to a regular `<div>` that can be used to contain the gradient buttons.

```
const gridStyles = css`
  display: grid;
  grid-template-columns: repeat(auto-fill, minmax(10rem,
1fr));
  grid-auto-rows: minmax(9rem, auto);
  grid-gap: 10vw;`;
```

When a gradient button is pressed, it sets the background on the application to that gradient. With all the values stored in a constant, we only need to store the ID in state.

We can use the second method of styling components – the `styled` function – to style a component based on external values. This is held in its own package that needs to be installed and imported separately.

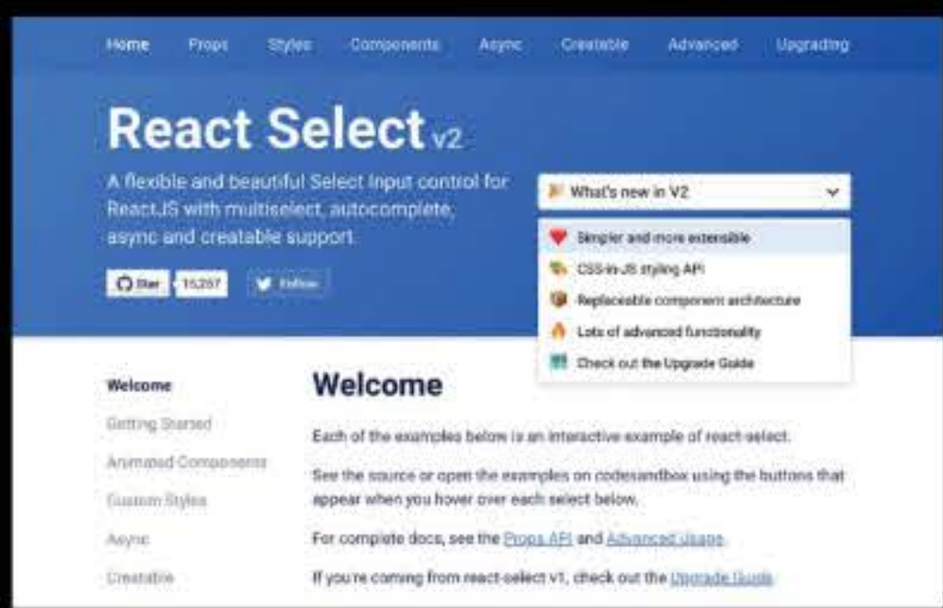
```
yarn add @emotion/styled
```

RESOURCES

FURTHER RESOURCES

There are lots of tools that already use Emotion to power their components. Here are some examples you can try out right now.

GOV.UK React *(https://github.com/govuk-react/govuk-react)*
The GOV.UK Design System is a pattern used to make functional and accessible UI components for the UK government website. The React port uses Emotion to style components following their core guidelines. Emotion was chosen as it enabled styles to be written as plain objects, which allows them to be easily accessed and shared between systems.



React Select takes often complex interactions and provides a simplified props-based API to pass data and deal with events

React Select *(https://react-select.com/)*
The `<select>` element is difficult to style at the best of times. It does not offer much in the way of styling or functionality, which leads many to third-party tools for the job. React Select is a flexible set of pre-made components for single- and multi-select data. Theming is built on top of Emotion, with hooks into styling particular sections such as the placeholder.

Circuit UI *(https://circuit.sumup.com/)*
Mobile payment provider SumUp needed a web implementation for its Circuit design system that would be put to use across many different sites with varying setups. A CSS-in-JS solution such as Emotion makes sense to keep setting up across projects as simple as possible.

```
import styled from "@emotion/styled";
```

The styled function works like the css method mentioned earlier but is called alongside the element or component that needs styling. It also takes styles written either in a template literal string or as an object. We can use this function to create a <Container> component to wrap the grid.

```
const Container = styled.main`
  background-attachment: fixed;
  min-height: 100vh;
  overflow: auto;
  padding: 5%;`;
```

We can now add the styled components to the render method. By iterating over the gradient array, we can make new buttons for each supplied gradient. Each one gets an onClick handler that switches the selected gradient.

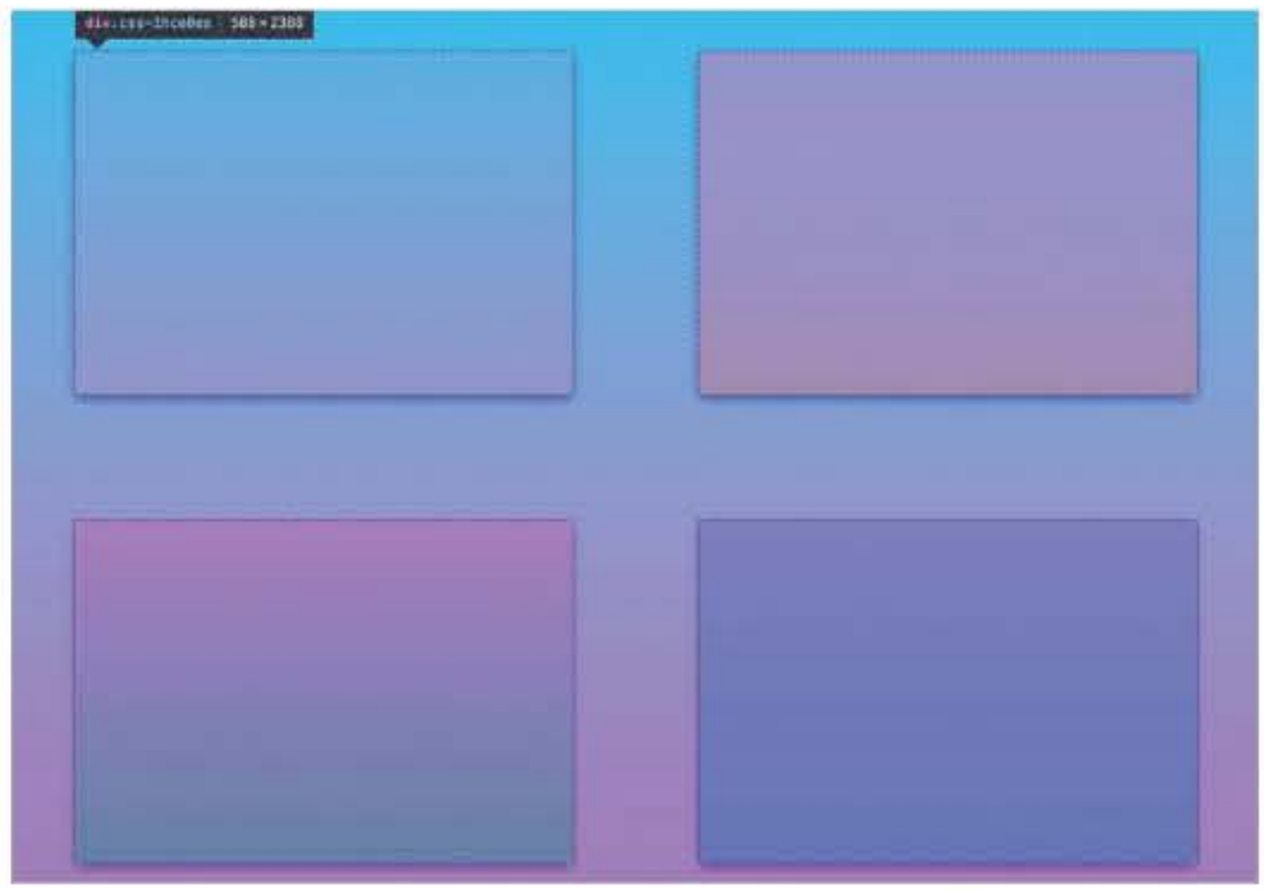
```
<Container selected={this.state.selected}>
  <div css={gridStyles}>
    {gradients.map(({ id, from, to }, index) => (
      <Gradient key={id} fromColor={from} toColor={to}
onClick={() => this.onClick(id)} />
    ))}
  </div>
</Container>
```

Components created using styled are able to have their appearance change in response to props passed to them. Template literals enable expressions to be evaluated within them when they are surrounded by curly braces. We can use this to pass props to the style by using a function expression.

By adding this to the container styles, Emotion will pass the current props object to each function expression as the string is evaluated. We can then generate any string but, in this case, we are creating the syntax for a gradient.

```
background: linear-gradient(
  180deg,
  ${props => gradients.find(gradient => gradient.id ===
props.selected).from}
    0%,
  ${props => gradients.find(gradient => gradient.id ===
props.selected).to}
    100%
);
```

Animation is a great way to provide a bit of playfulness and flair to an interface and Emotion makes them straightforward to create and share across components. The keyframes function works much like the other functions but enables us to create named keyframes we can apply to other styles throughout the application.



Above By using regular CSS grid syntax, we can lay out each gradient option automatically accounting for different screen sizes

Open up animations.js, which will hold the animations we wish to share. Import the keyframe function and create an animation we can use to display each gradient.

```
import { keyframes } from "@emotion/core";

export const reveal = keyframes`
  from {
    opacity: 0;
    transform: translateY(1rem);
  }
  to {
    opacity: 1;
    transform: translateY(0);
  }`;
```

The reveal constant can be used where a named animation would usually appear. Inside Gradient.js, we can import this constant and use it directly by adding an animation property.

```
import { reveal } from "./animations";
`animation: ${reveal} 0.5s ease-out;`
```

Emotion makes it possible for users to create dynamic, varied designs while also keeping things modular and reusable. It can be used across an application or on a per-component basis, which makes it a perfect candidate for an experiment in your next project. ■

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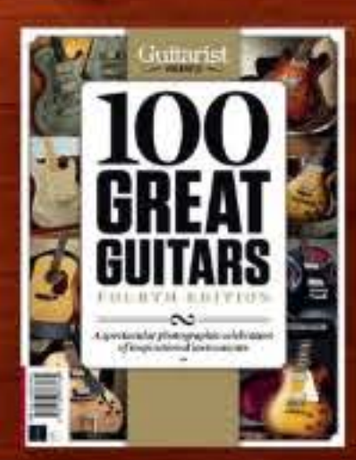

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ACCESSIBILITY

BEING PECULIAR

Suzie Miller explains how her role as solutions architect for Amazon changed her perspective on inclusive design

I hid my 'invisible' disabilities – including Ehlers-Danlos Syndrome (EDS), dyslexia and Aspergers – from employers for years but that all changed when I joined Amazon Web Services (AWS) as a solutions architect.

An internal course called 'Being Peculiar' opened my eyes: it was about embracing diversity and difference, helping me to realise that I could bring my authentic self to Amazon. My perspective changed and I started to see the link between my own life and the work that I would be passionate about taking forward in my new job.

Universal design is not just the right thing to do – there's also a strong business case for it when you consider that nine per cent of working-age adults are disabled and there are 13.9 million disabled people in the UK. Organisations that do not create inclusive products are missing out on unique expertise and a huge untapped customer base.

We believe that designing products with accessibility in mind will benefit all customers. If a non-disabled person cannot follow the flow of a website, there is a risk that those consumers feel alienated. For example, what if your customer speaks English as a second language or wants to change font sizes and colours to cater to their visual impairment? Considering accessibility from the outset is a brilliant way to cater for everybody without 'locking out' certain audiences.

Rather than leave accessibility to people with specific job titles, it's important to upskill everyone in these concepts. However, with development moving to agile processes, there aren't enough accessibility experts to have one per sprint so it's useful to include disabled 'user stories' and create accessibility champions in your organisation.

At Amazon we run a Global Accessibility Awareness Month internally each year, including talks, staff training, webinars and networking. I would also recommend checking out Amazon Polly, a text-to-speech service that can be incorporated into products, and Amazon Transcribe, which can be used to add captions to video content.

Accessibility is a word that conjures different meanings based on your life experiences. For many it still means access ramps or screen readers – but in my day-to-day role with Amazon and as chair of our People With Disabilities employee affinity group, I hope to raise the bar so that accessibility is viewed as equal to security considerations. WCAG and W3C standards shouldn't be considered as an afterthought and are a lot harder to retrofit. n

PROFILE

Miller is a solutions architect for Amazon UK and chair of the company's People with Disabilities employee affinity group.
W: https://aws.amazon.com/

ABOUT THE AUTHOR
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IMAGE OPTIMISATION

SLIM DOWN PNG AND JPEG FILES

Alexander Tolstoy reveals how to use state-of-the-art bitmap data compression for storage and web projects

The average speed of a modern internet connection would sound very futuristic to web masters of the past. Back in the early days of the web, the amount of transferred data was crucial, both in terms of time and cost, therefore everyone involved in hosting something online tried to make images smaller. Ironically, the problem has not gone away nowadays. Each time you visit a script-heavy web site (such as mainstream world news), it often pulls a dozen megabytes of JavaScript code, images, videos and whatnot. It may still be painfully slow and even cost a pretty penny for some mobile data users.

In this tutorial, we will find out the ways you can slim down bitmap files for the web. As long as it utilises the good old PNG and JPEG formats, we'll see how we can make them smaller without compromising quality, using some hot open-source findings. In the end, we'll have substantially smaller files that will still look good but require less time and data to get rendered in users' web browsers. Read on to dive into the details.

CHOOSE THE RIGHT FORMAT

It may sound trivial to still be harking on about file size, yet there are enough examples where an image is either too massive without any purpose or looks terrible despite being small. To avoid such mistakes, choose a format to save or convert an image wisely. Using JPEG implies breaking an

image into tiles of 8x8 pixels, where each tile gets compressed. The level of compression depends on the user (it's that slider when you save an image) but typically JPEG allows for 10:1 file size gain with an acceptable loss in quality. The perceptual difference between JPEG files made with high (80-100) and low (40-60) compression ratio is minimal for photographic images but highly noticeable for things such as digital artwork, icons and screenshots. Therefore it is recommended to choose JPEG for photos and go with something else for the other types of bitmap images.

PNG is one of the most suitable formats for network graphics (actually, that's what its abbreviation means). While the JPEG format is always lossy (even with quality set to 100), the PNG format can be either lossy or not. Moreover, even when it is, it compresses data by reducing the number of colours used in the image, so that the result commonly still looks crisp and clear. So choose PNG for depicting screengrabs or any other sort of pictures with solid fill.

START WITH CONVENIENT METHODS

Optimising bitmap files is possible with a bunch of freeware tools, so you don't have to rely on a full-fledged image editor. Imagine is one such application and it is incredibly easy to use. Just drag an image (or a stack of images) over the Imagine window and use the little sliders to adjust compression ratio. Imagine works with JPEG, PNG and WebP files and it is ideal for lossy encoding. The biggest advantage is that the tool is interactive; it instantly shows you how the image will look with the current settings and displays the proposed file size. Imagine works great for batch processing – at least it can save all opened images at once if you need to.

Needless to say, there are dozens, if not hundreds, of other JPEG and PNG optimisers, including some handy online services (like https://tinyjpg.com). But don't rush off just yet – we've got something better up our sleeve.

ADVANCED COMPRESSION TECHNIQUES

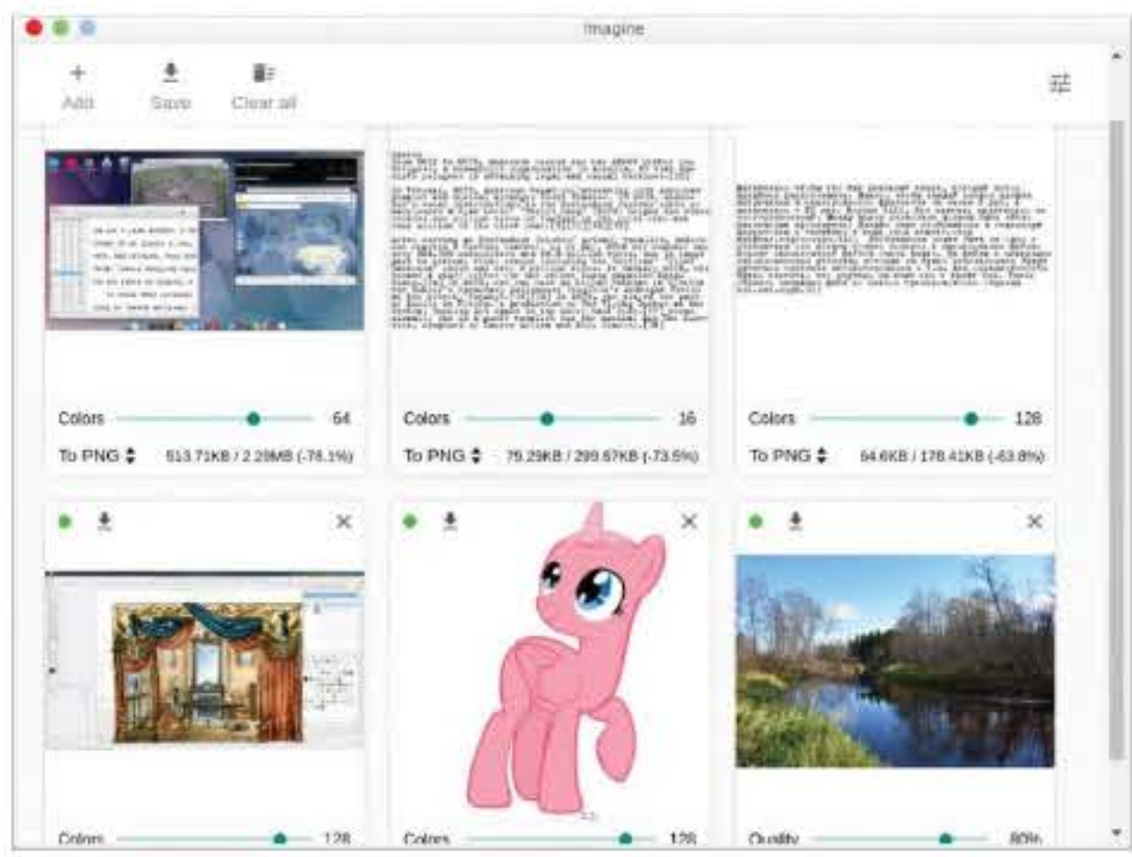
At first sight, it looks like we can't take much more of a bite out of lossy JPEG file sizes, something that can be instantly proven by futile attempts to further archive images using ZIP or any other compressing technique. But here comes Guetzli, a smart Swiss cookie and sophisticated perceptual encoder for JPEG. Guetzli makes an average JPEG smaller by 20 to 30 per cent by increasing its compression density. The secret is that the algorithm is aware of the way humans perceive what they see, so the resulting image still looks great to the eye. Guetzli is ►

* IN-DEPTH

ADD BLUR AND SAVE BYTES

You may have noticed that photos from different devices can have completely different sizes despite the same resolution. The reason is that digital cameras and smartphones apply different post-processing routines to their raw shots before saving files to JPEG. The JPEG encoders compress images based on their spatial frequency or level of detail in the image and therefore it is influenced by the amount of blurred areas as well as the power of the ‹beautify› filter. Although such post-processing is commonly disregarded by photographic professionals, it helps reduce the file size of a JPEG shot.

Blurring, beautifying or applying a median filter reduces higher frequency details on the image and boosts the effectiveness of any JPEG encoder. It is very simple to test: just add a little Gaussian blur to the image and resave it with the same compression ratio. The resulting file will be smaller! This technique is perfect for portraits that have a background. Select an object at the front, invert the selection and add blur. The image will not suffer from any loss of detail but the file size will be lighter. Of course, this method is only applicable to some kinds of image but if you see that the image contains too many abrupt colour or tonal transitions, it's time to process it with an image editor and possibly apply some softening filters.



Imagine is one of numerous apps for image optimisation. This app is based on Electron and runs perfectly in all major operating systems. Also, it provides a friendly interface for processing several images at once.

* RESOURCES

DOWNLOAD AND INSTALL THE SOFTWARE

Every piece of software that is described in this tutorial is open source, so you can use it freely. There is no need to bother compiling everything from sources, as most of the tools below have binary downloads. Here is how to get the software up and running.

Grab the Guetzli binary from

https://github.com/google/guetzli/releases
It's the easiest thing to do.

Zopfli only gives the code (build it with 'make') at

https://github.com/google/zopfli/releases

However, it may be wiser for you to get it through the node.js Package Manager:

```
npm install node-zopfli
```

Some helpful links for FLIF:

FLIF-hub:
Reference implementation, sources and Windows binaries:
https://github.com/FLIF-hub/FLIF

XnView MP:
A cross-platform photo viewer with built-in FLIF support:
http://www.xnview.com

qt-flif-plugin:
A heaven for Linux users:
https://github.com/spillerrec/qt-flif-plugin

Phew:
A viewer and QuickLook plug-in for macOS:
https://sveinbjorn.org/phew

Lepton:
Source code and Windows binaries:
https://github.com/dropbox/lepton

- a cross-platform command-line tool, which uses the following syntax:

```
guetzli [--quality Q] [--verbose] original_image output_jpeg_image
```

The original image can be either PNG or JPEG, while the output is always JPEG. Therefore, you can use Guetzli to convert PNG to JPEG thanks to its state-of-the-art compression. The quality should fall between 0-100. Guetzli is an incredibly resource-heavy software; it consumes nearly 300MB of memory per 1 megapixel and also a lot of CPU power. We hope your super-optimised JPEGs will not boost global warming...

Portable network graphics are a different story, as long as it was designed for lossless image encoding. When you save an image as PNG in an image editor like GIMP, you have a compression ratio slider with values from 0 to 9. Here 0 means no compression and it makes the image weigh as if it was saved as a TIFF. In contrast, 9 strips away most of the unneeded colour information and results in a file that is 15-20 times smaller than TIFF.

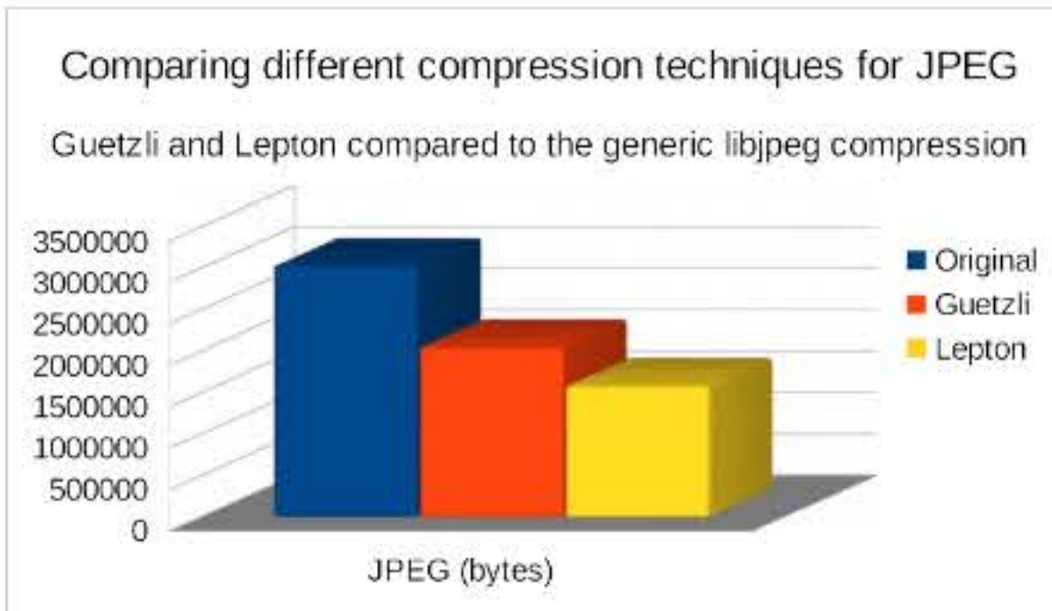
This time we'll try to make an already small PNG file (with ratio of 9) even smaller. For this purpose, we'll use Zopfli, another open-source tool that again has roots in Google Labs. Zopfli is a high-quality compressor for Deflate, Gzip and zlib data encoding. The interesting part is that Zopfli contains two encoders in one bundle: the general-purpose binary and the dedicated 'zopflipng' tool. The latter is exactly what we need! Zopflipng is a Deflate-based encoder with certain algorithms backported from the WebP format. It is smart enough to automatically choose the best strategy using scanline codes and removing various unnecessary chunks inside PNG. Use it with this simple syntax:

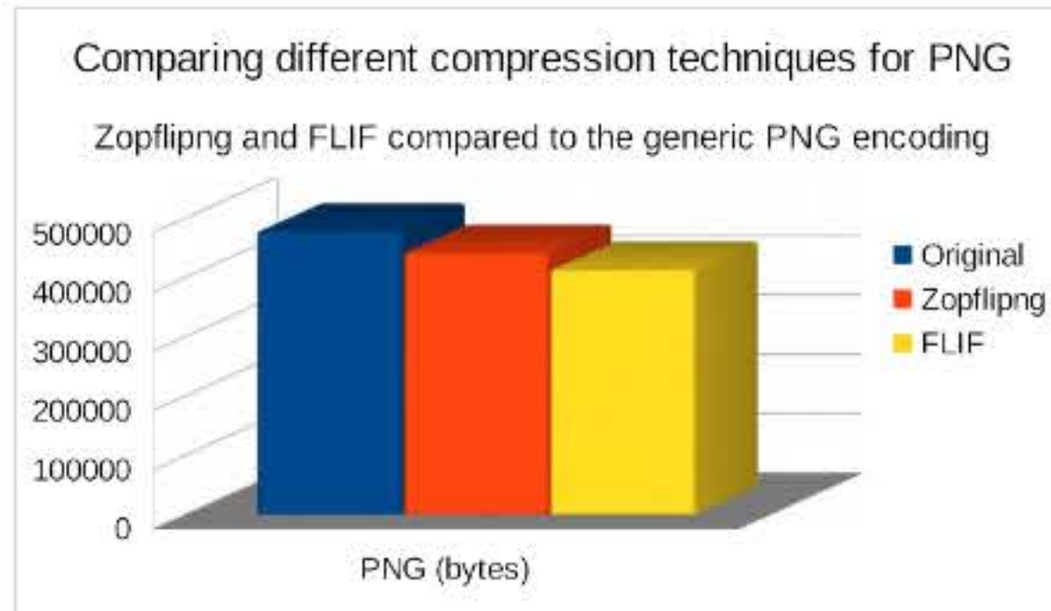
```
zopflipng original_png output_png
```

Zopflipng can probably do the job even better with the following explicit options:

```
zopflipng --iterations=500 --filters=01234mepb
--lossy_8bit --lossy_transparent original_png
output_png
```

The price you pay is the same as with Guetzli: the tool takes a lot of time to process an image, especially if it is large. The more iterations you use, the longer it will take but 500 is a reasonable number. The file size gain with Zopfli lies between 8 to 20 per cent, which is very good for visually perfect images. In brief, gaining 8 per cent is common for





Above left For JPEG, we used a test photo of a straw hat on a blurred background. Guetzli reduced file size by 33 per cent and Lepton by another 23 per cent. The final image was twice as small!

Above right The test PNG image was an ordinary 1920x1080 screenshot, originally saved with a size of 468KB. Consequent compression by Zopflipng and then FLIF gained 14 per cent without reducing the number of colours

screenshots, whereas 20 per cent is possible with photographs (when you need to store them as PNGs).

UPGRADE TO NEXT-GEN FILE FORMATS

Formally, this part goes beyond the scope of PNG and JPEG but it is very practical, since you can organise file conversion on-the-fly. What we mean here is using alternative and new image formats that outperform the best industry standards (read WebP).

One is FLIF, a new lossless image format based on the MANIAC (Meta-Adaptive Near-zero Integer Arithmetic Coding) compression method, which can outperform PNG, FFV1, lossless WebP, lossless BPG and lossless JPEG 2000 in terms of compression ratio. FLIF is available for all platforms and some image viewers already support it but it has a long way to go to hit the mainstream. Right now, it makes sense using FLIF for storage or on the server side. It can act like an efficient archiving format. You'll need to grab the code from the project's GitHub page and compile it. Once you have the `flif` binary installed, use the following command to encode a PNG image:

> "Lepton can slim down JPEGs by up to 22 per cent in the lossless mode, meaning that the encoder does not cause any loss in quality"

```
flif -e original_png output_flif
```

Replace `-e` with `-d` and put the files in reverse order to 'uncompress' your image back to PNG. In terms of tools, right now there are the FLIF WIC API component for Windows, the Qt FlIF plugin for Linux and the Phew image viewer and the QuickLook plugin for macOS (see the links section for details). Compared to the image that was previously tortured by Zopflipng, FLIF reduces its file size further down by ~10 per cent. Impressive results!

Our last hero is Lepton, another open-source format generously published by the Dropbox developers. Lepton does with JPEG what FLIF does with PNG. Lepton can slim down JPEGs by up to 22 per cent in the lossless mode, meaning that the encoder does not cause any loss in quality compared to the original JPEG file. Under the hood Lepton implies smart techniques of compressing those 8x8 JPEG blocks. Instead of writing zeros and ones, Lepton encodes bitmap data using the VP8 arithmetic coder, which respects context around each block.

Our test proved Lepton to be very efficient and fast. The command looked like the following:

```
lepton original.jpg output.lep
```

And in a second or two the tool produced the .lep file that was smaller by nearly one quarter of the original. Compared to the time-consuming Guetzli, Lepton is blazingly fast. You can use Lepton the same way Dropbox does. The format enables you to reduce storage costs by 20 to 25 per cent and since it is so snappy, you can do on-the-fly encoding/decoding sequences without major drawbacks. By the way, the decoding command is equally simple, it only needs to swap the two files and the resulting file is identical to the original JPEG:

```
lepton original.lep output.jpg
```

Use the described techniques to optimise user data storage or further improve loading speeds of your web projects. ■

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* USERLOOK

CONDUCT USER TESTS WITH USERLOOK

Daniel Schwarz outlines the benefits of user testing and demonstrates how you can run fast and free tests with UserLook

Assumptions are bad for business. They're bad because, by nature, we hold opinions based on the way we see the world and biases based on things that have happened to us. When it comes to design, making assumptions is dangerous because design costs money, time and resources. And it costs much more money, time and resources than it does to conduct some simple user testing that can help prove (or disprove) the theories we hold.

Following assumptions often results in at least one of the following outcomes:

- **Designing the wrong thing first**
- **Not designing the right thing at all**
- **Designing the right thing but doing it in the wrong way**

WHAT EXACTLY IS USER TESTING?

User testing is where users actually use an app or website (or, at the very least, a prototype of it) and offer feedback and insight that can be used to improve it. User testing goes above and beyond a simple feedback survey and involves watching actual users (or the target market) as they test our design.

In this article we'll self-service our own user tests using UserLook (https://userlook.co/) – this is where, after defining the questions that we'd like to ask, we send the user a link where they can conduct their

user test remotely in their own time. This helps us automate user testing (which saves time), while sourcing user testers from our own user-base (which saves money).

Note: If you'd rather have UserLook recruit testers for you, that's fine too – the pricing page lists various options.

WHEN TO USER TEST

You might be wondering how often you should run user tests. The short answer is: constantly – always be user testing. When decisions are fuelled by what users are outright asking for, you'll feel way less anxious and far more confident of success when the product you're designing finally becomes publicly available.

A majority of the time, teams throw in the towel with user testing because they don't understand why they're doing it and therefore ask all the wrong questions, which results in vague answers that don't offer much insight. Before asking questions in a user test, we first need to ask ourselves 'Why are we doing this?' and 'What do we want to learn from this user test?'

Before we begin, we first need to consider whether we're testing an MVP (a minimum viable product) – for which user testing is the right approach – or the usability of an already validated product, in which case usability testing is the right approach. If you're testing an MVP, then you're probably best off focusing on user testing.

When it comes to user testing the core question is: 'Does this solve the problem?' However, with usability testing, the defining question is: 'How well does it solve the problem?'

> "Teams throw in the towel with user testing because they don't understand why they're doing it and therefore ask all the wrong questions"

User testing comes first and this happens as soon as we have an MVP. Usability testing happens once the core product has been validated and it's time to flesh out the wider scope of functionality that the app or website is supposed to offer. To summarise:

- **User testing = user needs**
- **Usability testing = usability/UX**

* IN-DEPTH

GENERAL USER TESTING TIPS

Businesses that spend 10 per cent of their budget on usability and usability testing, on average, see a 135 per cent increase in their desired metrics; however, to reap these results our approach to user testing needs to facilitate maximum learning.

A contributing factor to the quality of the feedback received is how comfortable the user feels speaking freely and honestly. First and foremost, make it clear to the user that they are testing the design; we're not testing their abilities. Ask them to communicate not only honest and, if needed, harsh feedback but also emotions (ie relief, frustration, etc) and also what they're trying to accomplish (for added context). Family and friends won't offer quality feedback – since they won't want to upset you, their feedback will likely be biased.

Besides letting users open up, we also need to anticipate that users might have trouble communicating their feedback into words (despite us having an awesome video recording to accompany them). If needed, follow up to clarify any vagueness.

Conducting a self-service user test is no different than conducting a user test in real life – the same rules apply

* IN-DEPTH

TYPES OF USER/ USABILITY TESTS

Free exploration tests

A free exploration test is the user test you'll want to start with. When kicking off a round of user testing, you'll probably have loads of questions; way more than we can ever hope to answer in a single user test. A free exploration test can gauge initial reactions and help identify the most pressing concerns. We can also use a free exploration test to wrap up a round of user testing, just to make sure there's no stone unturned.

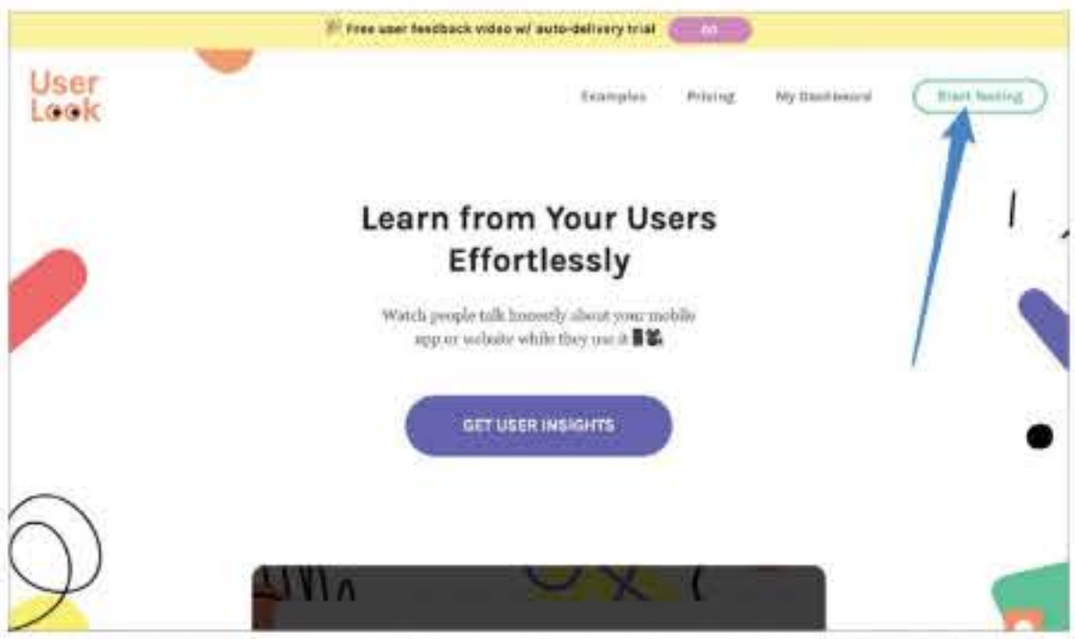
Performance tests

These are used to evaluate how well the user is able to complete a task. In addition to the written feedback, we can also accumulate more quantitative data like task time (by seeing how long the video lasts) and success rate (by awarding the user a score – 2 for 'completed', 1 for 'had difficulty' and 0 for 'fail'). Quantitative data can help us measure improvement over time.

Five-second user tests

In a five-second user test, users are awarded only five seconds to observe a screen before being asked a question like 'What was the website about?' or 'What do you think about our brand?' It's quite normal for users to make snap judgements, quickly hit the back button and delete apps without really giving them a chance. Although every second counts, the first five are the most crucial, hence why the five-second user test is so important.

Further reading: Learn about the different types of usability tests: *https://uxtricks.design/blogs/ux-design/usability-testing/*



Above To define the scope of a user test, click the Start Testing button in the top-right corner of the home screen

▶ SET UP USERLOOK

In this step we'll set up UserLook and define our question set, discussing test length, compensation and more along the way.

Start by signing up to UserLook, then choose:

- **"Start testing"**
- **"Self-service w/my own users"**

Some of the form fields are fairly self-explanatory (for example "Name of Test") but we'll run through some of the less-obvious options that can impact the outcome of our tests.

URL OF WEBSITE TO TEST

Obvious? Actually not so much! While you might think to add a live website URL here, we can actually include prototypes built with InVision Studio, Adobe XD, Sketch and basically any screen design tool that syncs mockups to the cloud – which means we can test sooner (ie before investing valuable money, time and resources getting into the various complexities of development).

To make this work, simply sync your design to Sketch Cloud, InVision or whatever the equivalent is in your design tool of choice, then paste the given share link into the form field.

USER VIDEO LENGTH

You're probably wondering why you would want to set a time limit on your user test. Here's one example: the five-second user test. In this day and age, where users are typically impatient, forgetful and easily distracted, a five-second user test can reveal what the user really remembers about what they just saw.

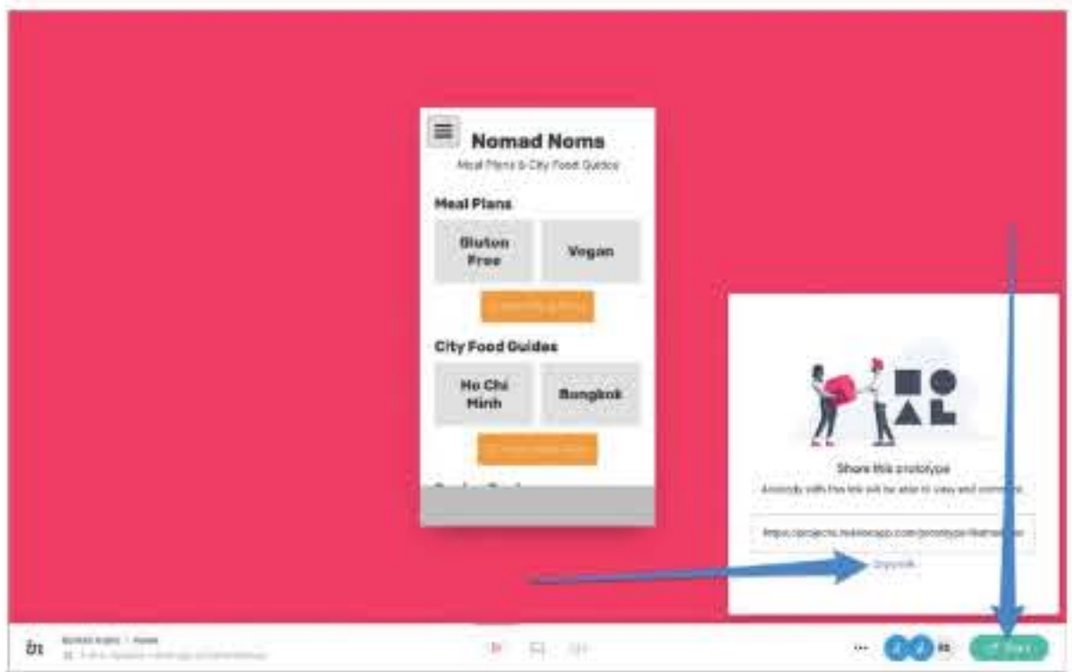
Was it immediately clear what the webpage was about? If the answer is no, then the user is likely to hit the back button. A five-second user test can determine whether or not the screen or webpage clearly communicates what the user needs to do.

USER COMPENSATION

While only optional, some level of compensation will create incentive for users to offer quality feedback. Compensation doesn't have to mean financial compensation though, it can be something as simple as free access to whatever you're building.

QUESTIONS/TASKS FOR YOUR PARTICIPANTS

Naturally, the questions themselves are the most defining aspect of the test. The truth is you probably have lots of questions but it's important to remember that we can conduct as many user tests as needed, so



Above left To test a prototype synced to InVision, open the prototype in the browser, click Share, then copy the link into UserLook

Above Setting up a user test in UserLook requires you to define a few settings, most of which are optional

> "Where users are distracted, a five-second user test can reveal what the user remembers about what they saw"

before each test, have a long and hard think about what you want to learn in each one.

For instance, an initial free exploration test might reveal that users have trouble signing up, so after designing another iteration one of the questions in a follow-up performance test could be: 'What frustrations did you have signing up?'

TEST CONTEXT INTRO

A context intro is the first thing users see when they start their test – this is where we introduce ourselves, explain what we're doing (and why) and set expectations. If the user is required to complete a specific task, this is where we'd introduce that task and state that there are a few questions to be answered (these will appear in the sidebar during the test process).

PARTICIPANT INFO REQUIREMENTS

Participant info includes name, email, age, occupation, location, household income and gender. If we wanted to see how different types of recurring feedback correlate with different demographics, we could segment this data to contribute to what are called user personas, a sort of written story that describes a certain user type as well as their needs and objectives.

For example, 18- to 29-year-olds and 48- to 59-year-olds will naturally have different needs and objectives when using, say, Facebook – where younger users might want to engage with brands and older demographics might want to stay in touch with friends. Although optional, this data can offer more context to the user feedback and contribute to the development of these personas.

WHAT NEXT?

After defining the scope, we should receive a URL that we can share with user testers. After that, users can complete tests in their own time, leaving us free to work on something else.

If the test questions have been defined correctly, we should have some high-quality feedback that's both actionable and consistent; this means it's clear what we need to change in the next iteration, with some feedback recurring more than others.

Next, it's simply a case of organising the feedback.

ORGANISE WITH AFFINITY MAPPING

Affinity mapping is a grouping technique used to organise various data, including insights, ideas, sketches, feedback and snippets of research; in this scenario we could organise our user feedback based on common themes. If we were user testing, for example, these common themes could help us create what's called a product roadmap, essentially a timeline of features and fixes focusing primarily on commonly occurring feedback while making less common feedback a secondary concern.

After implementing all of these high-priority improvements, features and fixes from the current sprint cycle, another round of user testing could then reveal a fresh collection of opportunities for improvement, laying the foundation for the next sprint cycle (which, by the way, could also include some or all of the low-priority tasks from the previous sprint). Then just rinse and repeat: always be testing! n

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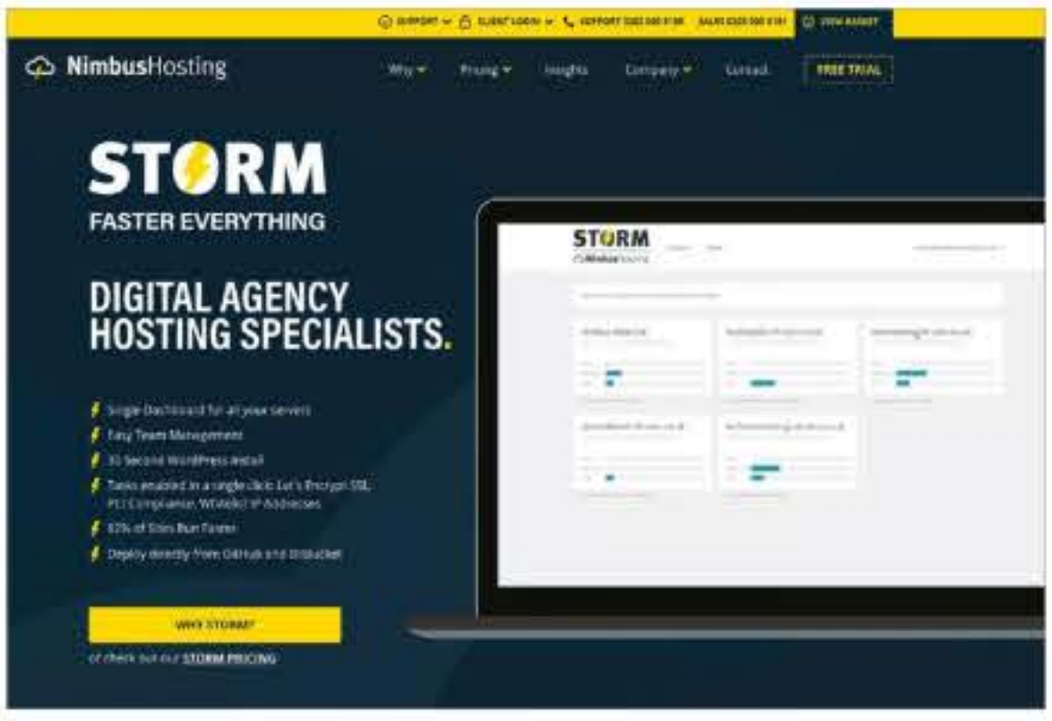

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