The Future of Frontend Development: Emerging Trends and Technologies

Introduction

History

Let's start with the history of the **Web**. It was 1991 when the first web page went live and our lives were changed drastically. Today, millions of people spend hours surfing the internet, making money and investing money, gaining university degrees, listening to music, and watching movies, educational theories, videos, and more.

Developing a Website and web applications has helped to strengthen your business brand and company brand. Albeit the year 2023, web development companies have been skyrocketing growth with every industry vertical out there vying for the business market.

Trends

Although front-end development trends are always evolving, some remain popular for a long time. Here are some front-end development trends that will be prominent in 2024. Today, we'll look at what is the future of web development and why your business needs to start thinking about it now.

Top 10 trends and technologies in the field of Web Development and the future of Web.

JavaScript

JavaScript is an ever-growing programming language, and with each annual update to ECMAScript it is getting better and better and becoming the best choice amongst developers. **ECMAScript 2022** is the 13th and current version and we can expect the EcmaScript 2023 in the coming days.

Here is the data which shows the popularity of programming languages in 2022.

Courtesy: https://www.statista.com/
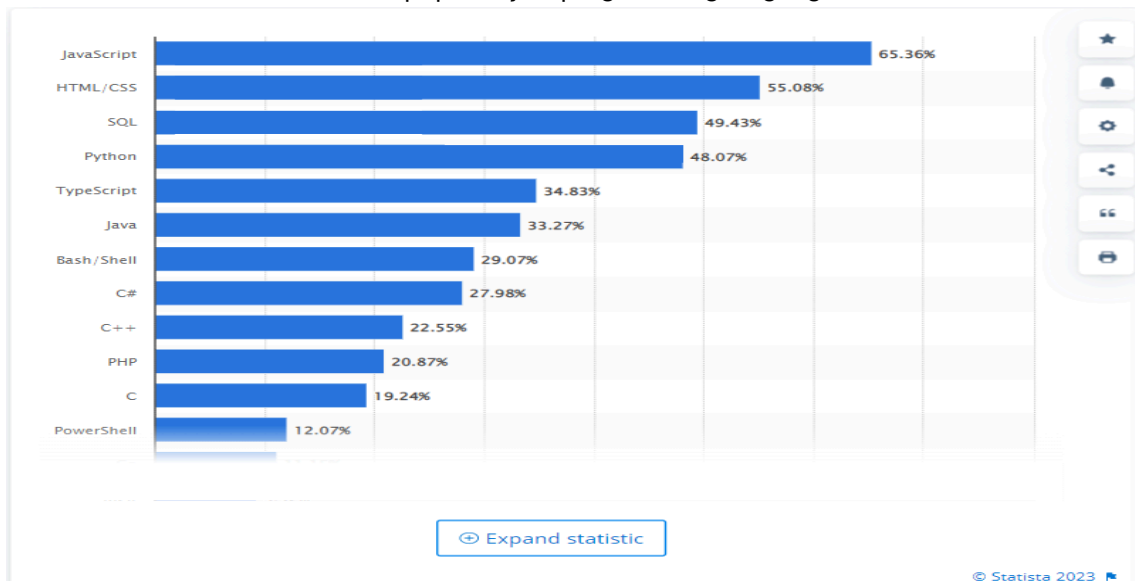
This clearly shows that Javascript is the most used language amongst the developers and this is not just for Frontend web development. Today JS is everywhere: Frontend , Backend, Server , AI , ML , Database in all the places we are using javascript. Isn't that really exciting to see the growing world of javascript?

Advantages of using JavaScript in 2023
- Client side Operations
- Powerful Frameworks
- Platform Independent
- Remarkable Versatility
- Write Server-side code
- Event-based Programming Features
- Multi-tasking
- Build dynamic websites

Javascript Frameworks
Javascript offers some of the most popular frameworks . These frameworks continue to grow and these are the best frameworks to choose from based on the requirements. These frameworks keep on adding new features with the new version. As there are many frameworks with pros and cons, let's have a look at some of the most popular ones.

- **React.js** - A very Popular and easy to learn JS library
- **Angular** - A complete JS framework , which provides end to end solutions.
- **VueJS** - A very lightweight JS library which is gaining popularity.
- **NodeJS** - A revolutionary JS Runtime which expanded JS to the backend as well.
- **Svelte** - Svelte is a free and open-source front end component framework.
- **Solid** - Solid is a reactive JavaScript library for creating user interfaces without a virtual DOM.
- **Next.js** - Open Source web framework enabling React-based web applications with server-side rendering.

A quick snap on the usage of JS framework and Libraries. These frameworks win the race in terms of awareness also. We can see React , Angular and Vue in the top 3 positions as per usage.
Vue.js is gaining popularity and will continue to grow.

Courtesy :- https://2022.stateofjs.com/en-US/libraries/front-end-frameworks/
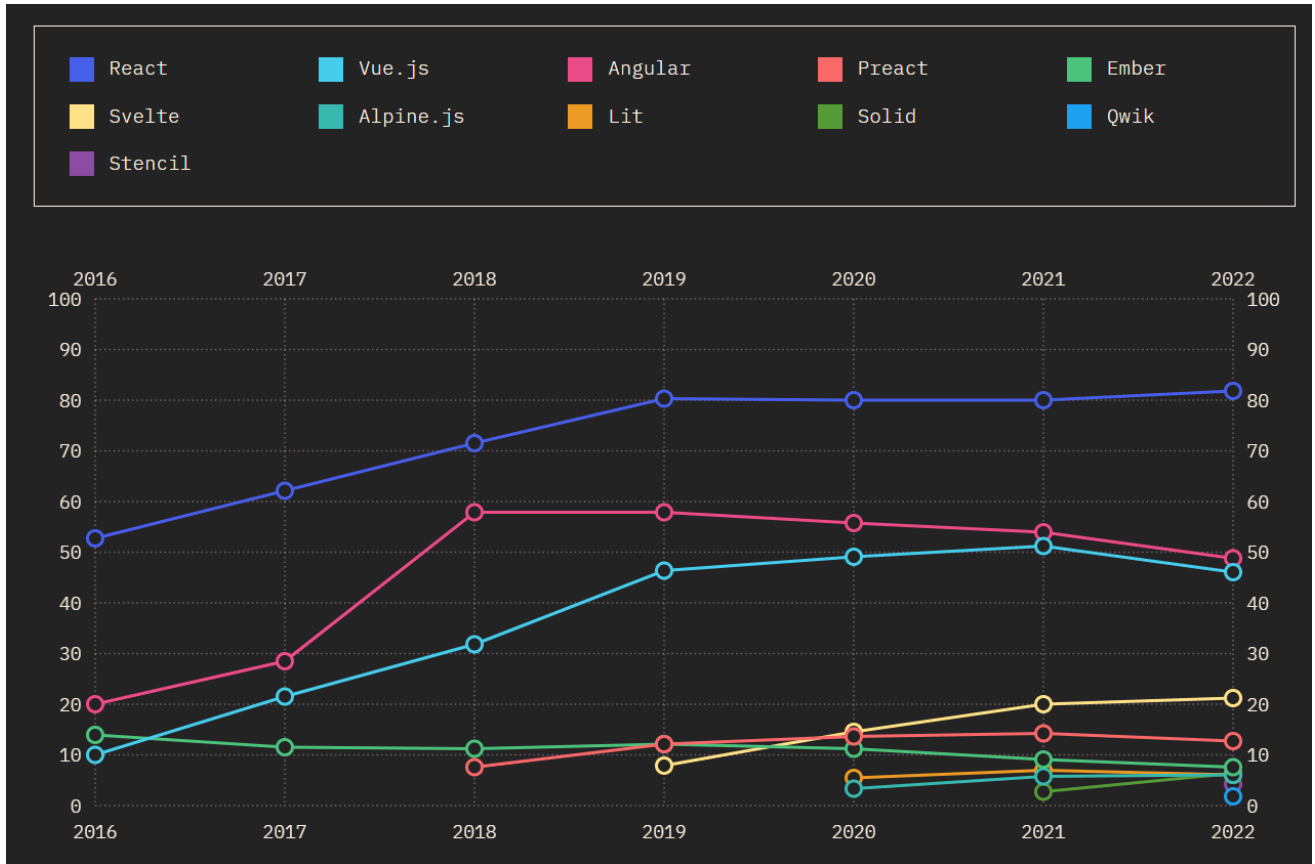
In 2022 The new JS frameworks like **Svelte** and **Solid framework will also** become popular in terms of retention.

Courtesy :- https://2022.stateofjs.com/en-US/libraries/front-end-frameworks/
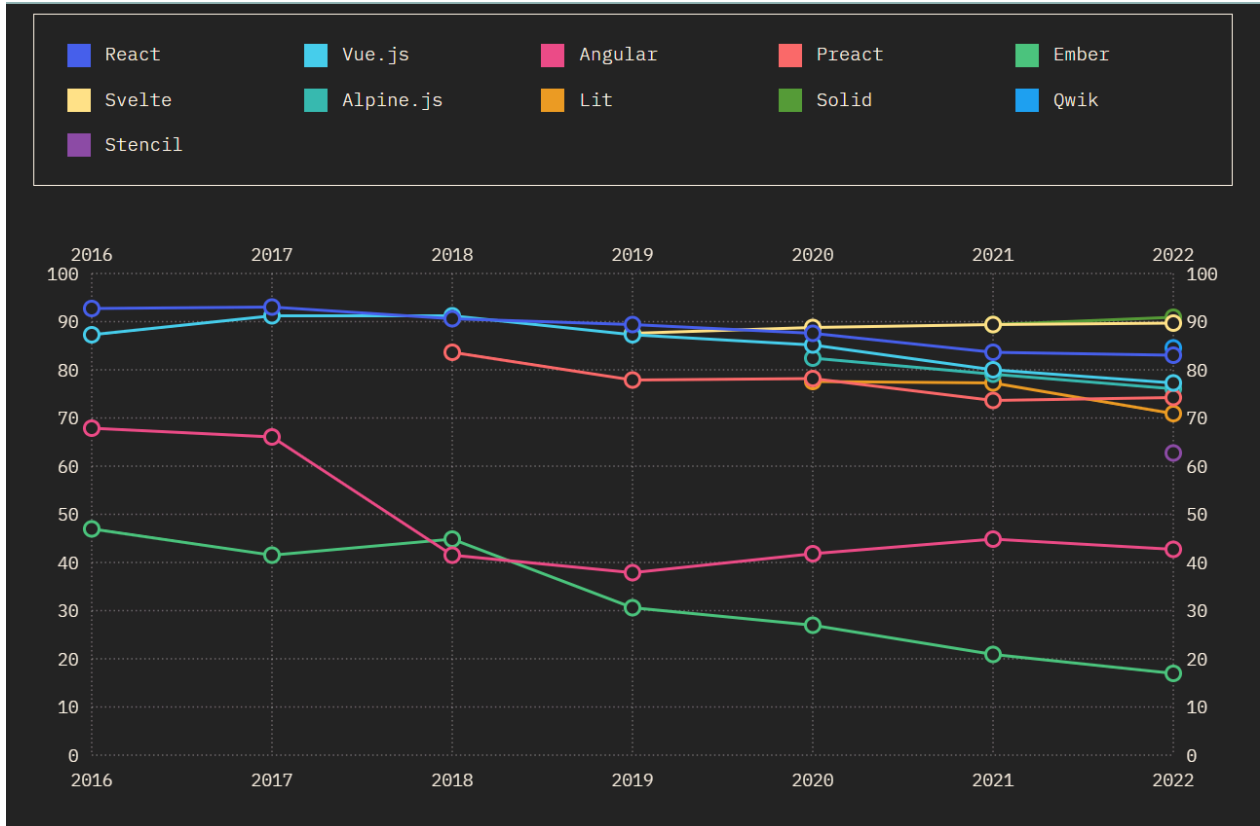
Jamstack

Static websites are coming back and gaining popularity and a new term for this new way of building websites is JAMstack. The JAMstack consists of a JavaScript-powered frontend for page interactions (J), APIs to connect to various APIs to get 3rd party functionality (A) and plain old Markup (HTML) which gets deployed to your instance (M).

JAMstack is the way of building websites and apps that delivers better performance, higher security, lower cost of scaling, and a better developer experience.

Here when we say "The Stack," we no longer talk about operating systems, specific web servers, backend programming languages, or databases.

JAMstack is not about specific technologies, it is a modern web development architecture based on client-side JavaScript, reusable APIs, and prebuilt Markup.

JAMstack projects don't rely on server-side code — they can be distributed instead of relying on a server. Served directly from a CDN, JAMstack apps unlock speed, performance and better the user experience.

How it works

1. Decoupling the frontend from the backend :- Unlike the large legacy apps, Jamstack projects neatly separate the frontend pages and UI from the backend apps and databases. Freed from backend servers, the frontend can then be deployed globally, directly to a CDN.
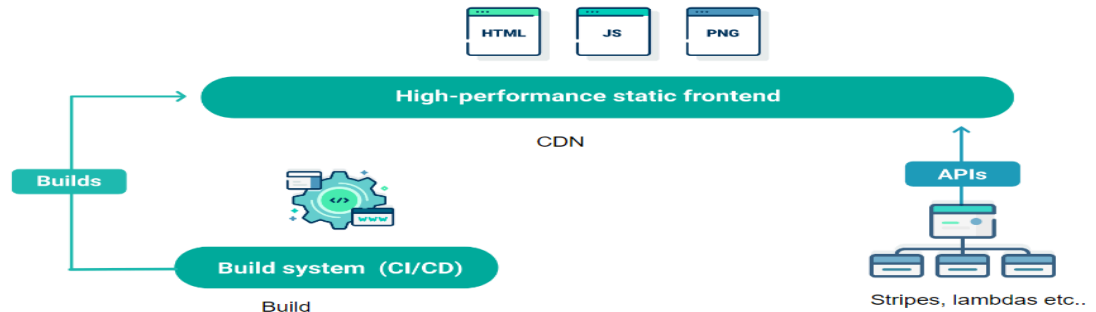
2. Prebuilding all pages for speed :- Before deployment, the entire frontend is prebuilt into highly optimized static pages and assets. This happens in a build process (before being deployed / hosted).
3. Dynamic content via APIs:- The global frontend uses JavaScript and APIs to talk to backend services, allowing pages to be enhanced and personalized.

Why JAMstack?

Traditional websites or CMS sites (e.g WordPress, Drupal, etc.) rely heavily on servers, plugins and databases. But the JAMstack can load some JavaScript that receives data from an API, serving files from a CDN and markup generated using a static site generator during deploy time.

JAMstack is fast
When it comes to minimizing the time of load, nothing beats pre-built files served over a CDN. JAMstack sites are super fast because the HTML is already generated during deploy time and just served via CDN without any interference or backend delays.

JAMstack is highly secured
Everything works via an API and hence there are no database or security breaches. With server-side processes abstracted into micro service APIs, surface areas for attacks are reduced and so your site becomes highly secured.

JAMstack is cheaper and easier to scale
JAMstack sites only contain just a few files with minimal sizes that can be served anywhere. Scaling is a matter of serving those files somewhere else or via CDNs.

How do I Get Started?
You can use some already built technologies to build JAMstack applications in a few minutes. Few popular technologies are **Gatsby** , **NuxtJS**, **Hugo** , **Netlify CMS**, **Svelte**.

Credit: https://www.netlify.com/jamstack/

Progressive Web Applications

The idea is that you start with something that is a website and that progressively becomes more like an application" – Alex Russell, software engineer, Google. (One of PWA Inventor)

PWA's combine the benefits of web and native apps to create fast, engaging experiences that work on all devices. With a PWA, you can do much more with your website than ever before. They can be made available in the App Store or Google Play Store while being available for the web.
In addition to working offline, PWAs support push notifications and background updates, making it simple for users to stay up to date on your organization or institution's latest news.

User Retentions through Push
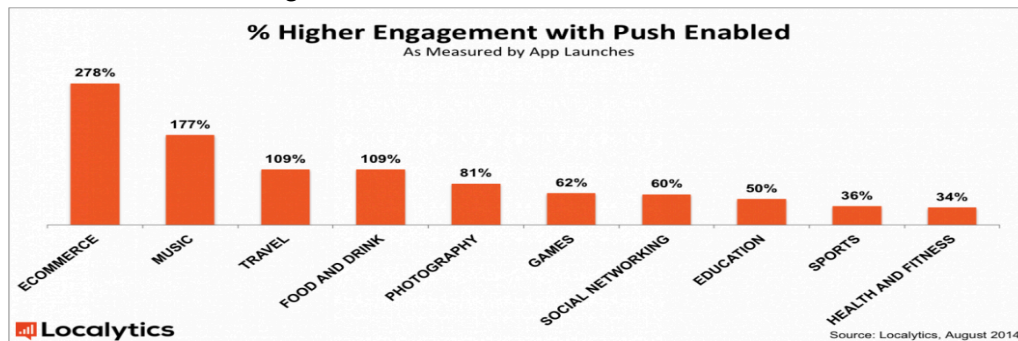
The curse of Mobile apps and rise of PWA
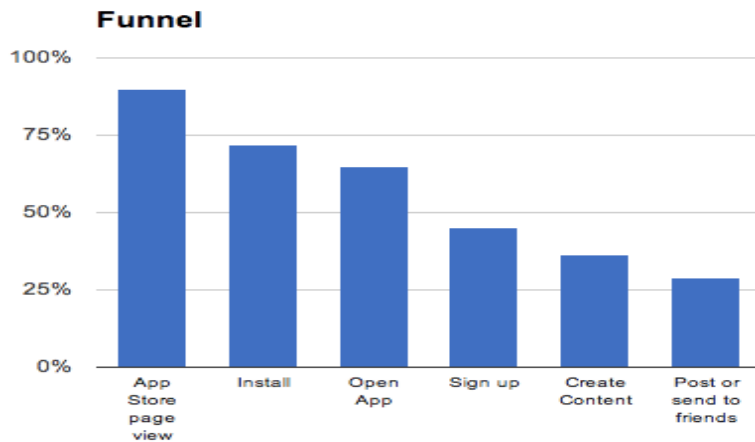
Above data clearly shows how many apps users install and then how many of them they are really using. This is app fatigue and PWA is the answer to this problem as we are not creating the APP we are just creating the Website that will act as an App. And with push notification we can engage the client again and again.

Mobile App

Find app in App Store

Download the App

Install the App

Open the App

Accept T&C & Sign-Up

Login & start using it

PWA

Instantly open the site and add to home screen

Launch, Accept T&C & Sign-Up

Login & start using it

As soon as we visit the website in the browser we suggest the user to install the site then and there. Once installed the site became and acted the same as any other mobile application.

Some of the most important features of PWA.

- **Progressive** - works well on any device or browser, through progressive enhancement
- **Linkable** - easily shareable through URL
- **Discoverable** - Recognized as app and easily searchable through SEO
- **Responsive** - fits well in any screen size: mobile, desktop, tablet and any future devices
- **Installable** - easily added to the home screen, and readily available
- **Independent** - work both offline and in areas with low-level connectivity
- **App like** - native app feel with similar navigation, interactions, and minimal page refreshes
- **Re-engaging** - through push notifications, best practices of native apps
- **Fresh** - seamlessly updated content to users
- **Safe** - served through HTTPS (mandatory for PWA to work)

PWA Success Stories

Infobae more than doubles time spent on mobile site with a Progressive Web App

Infobae took advantage of service worker to deliver reliable performance on unreliable networks. Their best-in-class PWA achieved a performance score of 93/100 on Lighthouse, an automated tool for measuring web-page quality.

Read more

Tags: casestudy progressive-web-apps

Twitter Lite PWA Significantly Increases Engagement and Reduces Data Usage

The Twitter Lite Progressive Web App combines the best of the modern web and native features to deliver a more robust experience, with explicit goals for instant loading, user engagement and lower data consumption

Read more

Tags: casestudy progressive-web-apps

The Washington Post

AMP helps the Washington Post increase returning users from mobile search by 23%!

'We are committed to improving speed across the board. If our site takes a long time to load, it doesn't matter how great our journalism is, some people will leave the page before they see what's there'
David Merrell, Senior Product Manager, The Washington Post

Read more

Tags: progressive-web-apps serviceworker casestudy

Progressive Web App at Voot

Voot.com launches their media Progressive Web App in India. Within days of implementation, session time per user increased by 39% and daily views per user by 15%.

Read more

Tags: media casestudy

Flipkart triples time-on-site with Progressive Web App

In 2015, Flipkart, India's largest e-commerce site, adopted an app-only strategy and temporarily shut down their mobile website. The company found it harder and harder to provide a user experience that was as fast and engaging as that of their mobile app. But then, Flipkart decided to rethink their development approach. They were drawn back to the mobile web by the introduction of features that made the mobile web run instantly, work offline, and re-engage users.
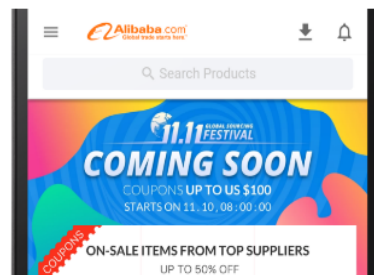

Alibaba

Alibaba.com is the world's largest online business-to-business (B2B) trading platform, serving 200+ countries and regions. After upgrading their site to a Progressive Web App (PWA), they saw a 76 percent increase in total conversions across browsers.

Read more

Tags: progressive-web-apps serviceworker casestudy

90% of Native features achieved on Web

This is amazing to see what all now we can achieve through the web. Here are the amazing native features that we can achieve through the Web now.

What Web Can Do Today

Can I rely on the Web Platform features to build my app?
An overview of the device integration HTML5 APIs

✓ Feature available in your current browser   ✗ Feature not available in your current browser

Native Behaviors

- LOCAL NOTIFICATIONS ✓
- PUSH MESSAGES ✓
- FOREGROUND DETECTION ✓
- PERMISSIONS ✓

Seamless Experience

- OFFLINE MODE ✓
- HOME SCREEN INSTALLATION ✓
- BACKGROUND SYNC ✓
- INTER-APP COMMUNICATION ✓

Input

- TOUCH GESTURES ✓
- SPEECH RECOGNITION ✓
- CLIPBOARD (COPY & PASTE) ✓
- POINTING DEVICE ADAPTATION ✓

Surroundings

- BLUETOOTH ✓
- NFC ✓
- PROXIMITY SENSORS ✗
- AMBIENT LIGHT ✓

Camera & Microphone

- AUDIO & VIDEO CAPTURE ✓
- ADVANCED CAMERA CONTROLS ✓
- RECORDING MEDIA ✓
- REAL-TIME COMMUNICATION ✓

Location & Position

- GEOLOCATION ✓
- GEOFENCING ✗
- DEVICE ORIENTATION ✓
- DEVICE MOTIONS ✓

Device Features

- NETWORK TYPE & SPEED ✓
- ONLINE STATE ✓
- VIBRATION ✓
- BATTERY STATUS ✓

Screen & Output

- FULLSCREEN ✓
- SCREEN ORIENTATION & LOCK ✓
- WAKE LOCK ✓
- PRESENTATION FEATURES ✓

Operating System

- OFFLINE STORAGE ✓
- FILE ACCESS ✓
- CONTACTS ✗
- STORAGE QUOTAS ✓

Courtesy :- https://whatwebcando.today/

Reference PWA Architecture
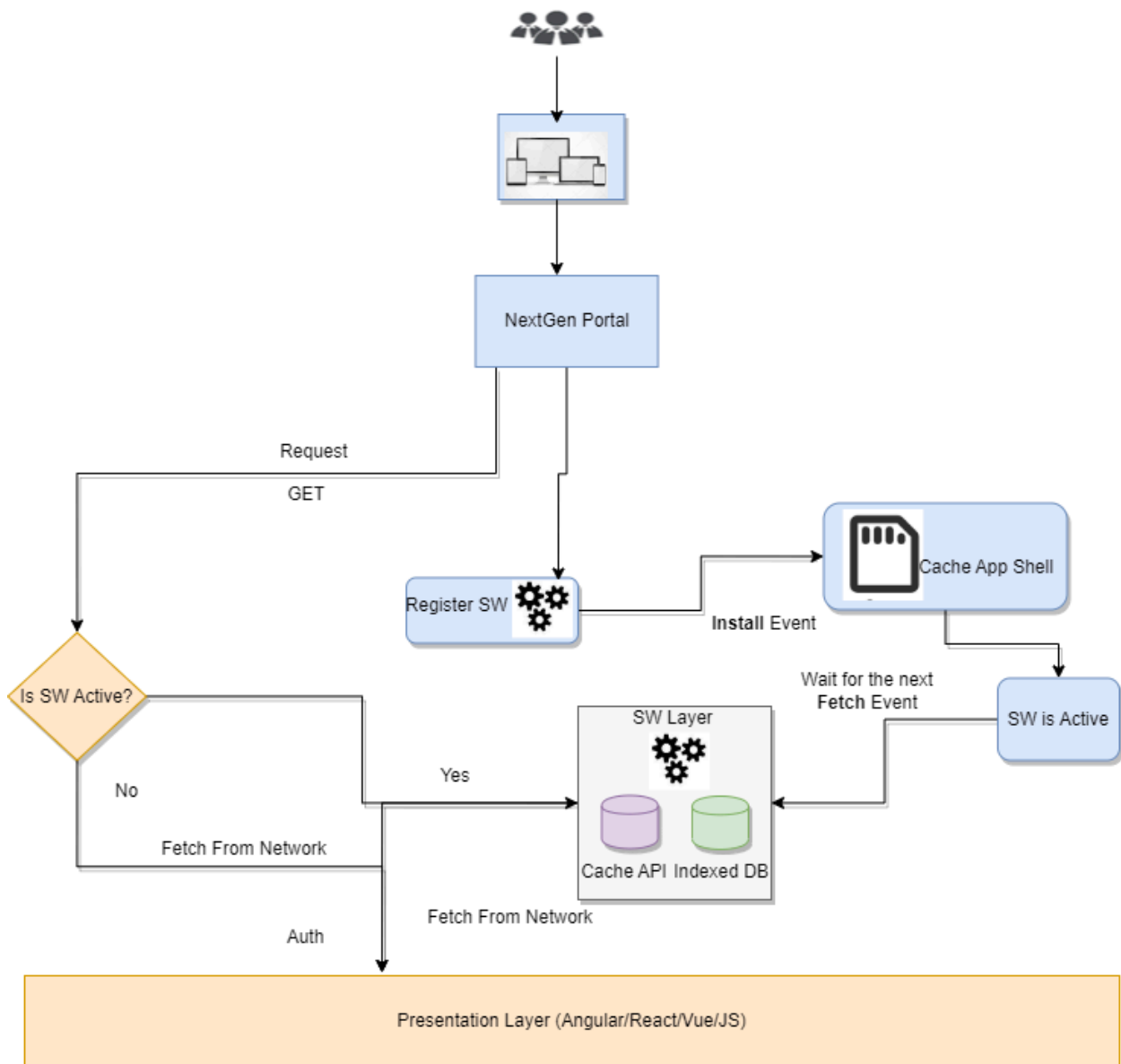
Case Study

PWA-enabled Construction Calculator Mobile Application

Product:

FixPoint : Our client supplies the **worldwide construction industry** with technologically leading solutions. Their goal was to launch **a new mobile application** to replace the old one with a legacy technology stack. We suggested using the **PWA (progressive web app) approach.**

Location: Kharkiv, Ukraine

Headless CMS Architecture

To understand why headless CMS has become popular let's understand the limitations of traditional CMS systems.

In the traditional approach we put all content—images, videos, texts, and code—in a single box.
It means the frontend and backend are coupled together, making it very difficult to process content updates.

Nowadays people consume information via many devices simultaneously. So, imagine that a customer wants to buy baskets. He or she starts searching for them on the phone, then compares reviews on the desktop, and finally makes a purchase via a tablet. All of the content must look good on all of the devices involved, which is why headless architecture for content management is the way to go.

It doesn't make traditional CMS bad. It's simply a fact that content consumption has evolved, and so has web development.

The point of using headless CMS is to make content delivery fast and easy.
In a headless CMS, the frontend and backend are separate (decoupled), they represent two different systems: One is responsible for content creation and storage, and the other is used to present it.
Once the content is created, the headless architecture uses API to deliver it and make it look good on any device.

Many content giants like Netflix were the first to adopt the headless CMS system.
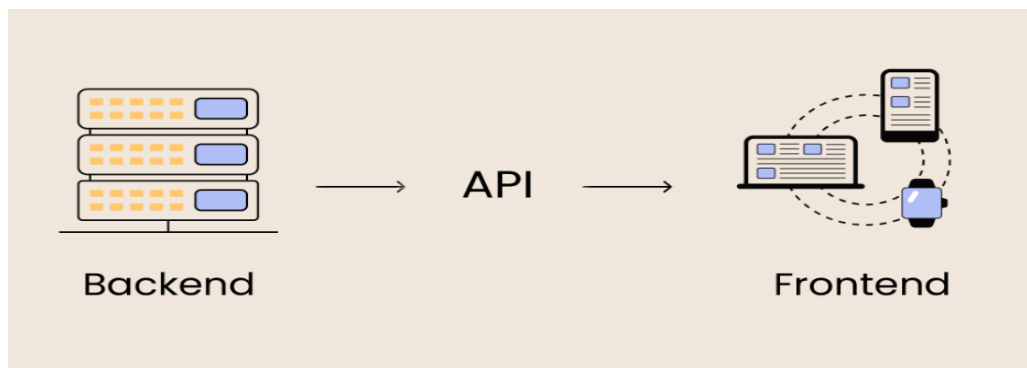
Case Study

Support Services for Content Management System
Product:

CMS Support - Global media technology solutions vendor develops content management and workflow processing system.

Solution provides a centralized location where users can view and manage information associated with content delivery to multiple platforms in multiple formats with different metadata.

Location: Bangalore

Motion UI

Motion UI is a Sass library for quickly creating CSS transitions and animations.

An expertly designed and implemented motion UI can provide a visual appeal that really grabs users' attention. It is because a sequence of animated elements is simply easier and quicker to view than text, instructions, and other static information.
Motion UI communicates a sequence, transition, next step, or action for a digital product, thereby making navigation easier.

How Motion UI helps the User -
- Direct the user's attention to the exact areas of hierarchy on a web page, which was removed due to the loss of heavy gradients.
- Help users learn how to retrieve the context and find out its exact location.
- Help to retain the 3D space of the context to some extent, which would have otherwise been lost due to removal of the shadows.

Places where we can put the Motion UI to use.

- Dynamic or Animated Charts - This helps to break away from the monotonous and eye straining chart images
- Slo-mo Page Background Animation - You can use CSS animations to put up a page background for your website, which is ever so slightly changing.
- Modular Page Scrolling - You can now scroll separately individual columns of a page, or rather as a whole.
- Progress CTA Buttons - Turn your CTA buttons into progress bar buttons easily.

Accelerated Mobile Pages (AMP) & Mobile-First Approach

Nowadays people prefer smartphones and tablets over desktops, and statistics reveal the same.
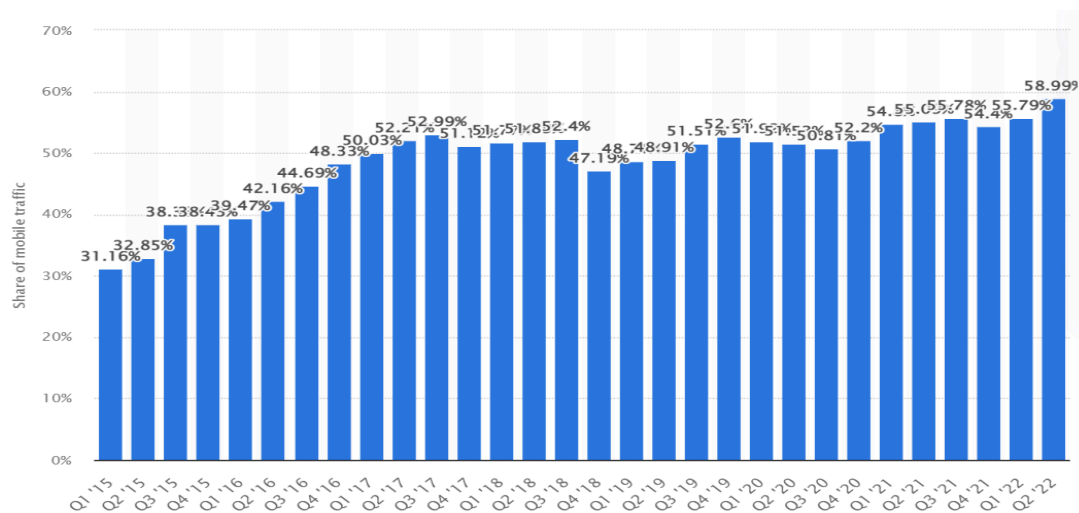
Courtesy:- © Statista 2023

As the above image shows A whopping **58+ Percentage** of all website visits in 2022 comes via mobile devices, and the numbers will continue to grow. This data shows why mobile first approach and with that AMP should be the choice to capture this growing audience.

With the mobile-first approach, another term that'll be in trend in 2023 is AMP.

Google's open-source Accelerated mobile pages (AMP) initiative strives to improve the performance of websites for mobile users.
In 2016, Google described the initiative in a blog post as a way to 'accelerate rich content like animations, video, and graphics in conjunction with intelligent advertisements and have them load instantly.'

Benefits of AMP
- Accelerated Mobile Pages (AMP) is the future of web development. AMP technology is introduced to create web pages that load faster on mobile by stripping down HTML.
- The "lightweight" AMPs use a stripped-down version of HTML and a lightweight version of CSS.

AI Chatbots Are Becoming More Intelligent

We have regularly looked at the increased use of chatbots over the last few years, and the popularity with businesses, in particular, doesn't seem to be declining.

Covid19 pandemic made us rethink the importance of AI enabled Chatbots. Many companies have started incorporating artificial intelligence into their customer support to provide even more comprehensive service.

Chatbots enable you to provide customer service on a 24/7 basis. Chatbots are no longer a gimmick, as they can streamline your customer service processes.

In addition, many businesses use chatbots on their websites to encourage customer engagement. Recent advances in artificial intelligence and natural language processing mean that chatbots can engage in complex conversations easily without requiring human intervention.

ChatGPT is the biggest example of what an AI enabled chatbot can do which is fine-tuned with both supervised and reinforcement learning techniques. It has many capabilities like: Q&A function. Solving math equations. Text composition (academic articles, movie scripts, poems, etc

The future of AI enabled chatbots is very bright and they will keep integrating with many service platforms.

Decentralized Technology and blockchain for Web Development

What Are Decentralized Applications (dApps) and their use case?

- Decentralized applications—also known as "dApps" or "dapps"—are digital applications that run on a blockchain network of computers instead of relying on a single computer.Decentralized means that the web apps won't have a central server or storage. Facebook, for instance, has its own data center.
- Because dApps are decentralized, they are free from the control and interference of a single authority.Everything we post on Facebook is stored in their data center, where they have the ability to alter it at any time or remove it entirely if they choose. However, in a decentralized system there will be no scope for doing so. Each user will be in charge of their own security and data.
- Benefits of dApps include the safeguarding of user privacy, the lack of censorship, and the flexibility of development.
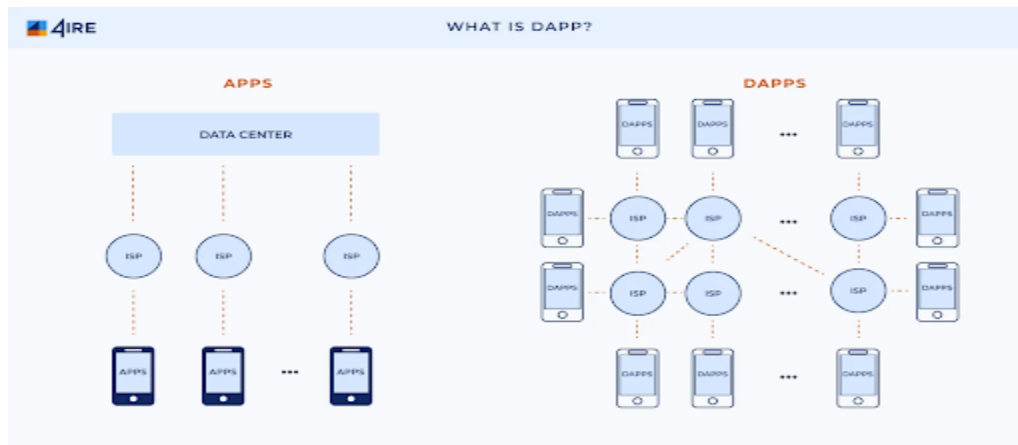
Courtesy : 4IRE

Blockchain and its Impact on Web

Blockchain is the chain of blocks. Blockchain contains three major components of all the files stored. They are miners, nodes, and blocks that create blocks, and link them securely. Blockchain technology is being used in many industries to protect and decentralize the sharing of digital information.

The most important benefit of blockchain is security. Because a blockchain is decentralized, it is challenging to alter or delete the information that has been recorded. Therefore, using Blockchain means you won't have to worry about data theft by hackers or rely on a third party to store your data.

Blockchain technology is a breakthrough in several industries, including healthcare, manufacturing, and financial services. In the coming days many more areas will be explored and industry is adopting this technology. Blockchains' underlying technology can be applied to improve web development and provide a better user experience.

Below are the areas in which we can expect the use of blockchain technology in coming days.

- SEO
- Dispersed Cloud storage
- Website Security improved
- Secure Network Transactions
- Establishing a higher bar for honesty and integrity.

Voice Search is Rapidly Increasing in Popularity

Generation Z, in particular, loves using voice assistants, such as Siri and Alexa, to search for information. According to recent GWI data reported in the October 2022 We Are Social Report, 22.5% of internet users aged 16 to 64 use voice assistants each week. And that doesn't even include Generation Alpha, who probably use it even more than their older siblings and parents. Interestingly, 17.0% of 55–64-year-old males and 16.3% of that-aged females have converted to using voice search, so it's not just youngsters who don't feel like typing.
While Siri and Alexa will work for virtually any website, web developers are making it easier for them by optimizing their sites with voice search in mind. By doing so, they are also making their sites more accessible for hearing and sight-impaired people.c

Augmented and Virtual Reality

VR is 75 percent virtual, while AR is only 25 percent virtual. VR requires a headset device, while AR does not. VR users move in a completely fictional world, while AR users are in contact with the real world.

By 2024, the global market for AR, VR, and MR is expected to reach $300 billion. Those technological breakthroughs have already permeated our daily lives – consider all the filters and amusing masks you see on Instagram and Snapchat. They're possible thanks to augmented reality (AR).

The applications of AR aren't just limited to the camera filters for social platforms; the eCommerce, architecture, manufacturing, tourism, and beauty industries can all benefit from these innovations, which have the potential to enhance the client experience and help connect the consumer to the item or service.

We can think of a complete new experience and revolution in the e-learning platforms using AR and VR.

With Ikea as a case study, you can put a three-dimensional model of a sofa in your own space that is true to scale. With the 360 view and virtual placement of products of many e-commerce giants like Flipkart , amazon provides the virtual visualization at any location you want by placing the product virtually. This is a really amazing use of AR/VR technology . You may also virtually wear your favorite shoe with Wanna Kicks, an app that lets you virtually wear your favorite shoe. These are examples of mobile apps, but the technology can be used on your website, as well.

Conclusion

We have seens the emerging trends and technologies. We have also considered the best technologies. As we see the trends keep on changing and the JS ecosystem keeps on increasing and it has become so huge. There are countless other examples of how technological advances have already changed our lives and will continue to do so in the years ahead. Technologies that fit into this trend, such as Vue.js , AMP, JAM are definitely going to take advantage of it to gain popularity; however, this doesn't mean that the frameworks backed by Google or Facebook are bound to disappear. It just means that they also have to adapt in order to not lose the battle against new easy-to-use frameworks, as Next.js has shown us. Every Framework or technology has its pros and cons and we need to select wisely based on our requirements.

References and credit :
https://www.statista.com/
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