



## COMPARATIVE STUDY OF FULL STACK VS. MEAN STACK VS. MERN STACK

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**Abstract :** The landscape of web and mobile application development is continuously evolving with a plethora of technologies available for creating feature-rich apps. In this dynamic environment, the choice of a development stack becomes pivotal, categorized into technology stack and application stack. A development stack is essentially a combination of various technologies necessary for building applications. The expansion of the web and mobile app market intensifies the debate over selecting the most suitable stack for custom app development. Robust infrastructure is imperative for software programs to thrive in this volatile environment. Achieving optimal levels of performance, scalability, and flexibility requires developers to carefully choose the appropriate stack. Understanding the features, cost-effectiveness, and associated benefits of different stacks is crucial for developers to make informed decisions, ensuring the success of their projects.

**IndexTerms - Full stack web development, Front-end, Back-end, Programming, Server-side, Client-side, Development, mean stack, mern stack, ETC.**

### I. INTRODUCTION

Agile development[4] is growing in acceptance, and in order to take advantage of its full potential and optimize return on investment, businesses must have the best possible technology infrastructure. A collection of interoperable technologies and programming languages is referred to as a "technology stack". Applications and technology stacks are the two main categories of development stacks. Building web and mobile applications is done with these stacks. Within software development, the term "former" has cross-disciplinary meanings. Comprising appropriate programming languages, patterns, libraries, tools, frameworks, and UI/UX solutions software, stack technology is summarized as follows. Thus, prior to selecting the optimal stack: Full Stack vs. Stack MEAN vs. MERN Stack, we advise you to think about the following advice. This will undoubtedly assist you in selecting the appropriate tech stack for your next project. Understanding your project requirements and their goal

1. Agility introduction
2. Go beyond project requirement for better audience
3. The final development cost

In a nutshell, stack technology consists of suitable programming language, patterns, libraries, tools, frameworks, and UI/UX solutions software. Therefore, we advise you to take into consideration the following guidelines before deciding which stack is best: Full Stack vs. MEAN Stack vs. MERN Stack. You can choose the appropriate tech stack for your next project with the help of this.

- Understand your project requirements and their goal
- Agility introduction
- Go beyond project requirement for better audience
- The final development cost

Which stack is the most popular, you must be wondering now. With this paper we are providing you the **Full Stack vs MEAN Stack vs MERN Stack** war so easily you can choose which one will be the best web development stacks.

But before choosing your stack, you should consider these questions:

- What are your project requirements?
- Do you want agility?
- Do you want to exceed beyond project requirements to get a better audience?
- Is your team/company knowledgeable and expert in this field?
- Is your development team scalable and flexible?
- What is the final cost of development?

### 1.1 Full-Stack Development

A full stack developer uses a set of tools and programming languages to work on both the front end and back end of an application or website. This is known as full stack technology. It indicates that Full Stack developers are capable of working on an application's Front End, Back End, Version Control, Server, APIs, and Database—all of which are part of the Full Stack. The term "Full Stack" Developer was thus born.

Full-stack comprises four critical software solutions:

- Frontend
- Backend
- Testing
- Mobile app

Companies typically assign experienced employees to one of the departments. But as contemporary offices change, so does the need for qualified applicants with supplementary technology skills. The following list includes some of the essential skills: Frontend: CSS, JavaScript, Angular, TezJS, React, TypeScript, Single Page Applications like HTML5 and Ajax, etc. Backend: Django, Middleware, Caching, NodeJS, ExpressJS, GO, Python, PHP, etc. Database: MySQL, Postgres, MongoDB, SQLite, Clusters, and so forth. Mobile Apps: iOS and Android DevOps: pipelines for continuous integration and deployment, creation of the Software Development Life Cycle (SDLC).

Managed project design structure is usually the responsibility of a full-stack web developer. The developer may assume different development roles depending on the needs of the project. Mern Vs Mean Stack developers are also more adept at providing solutions across various web architecture streams because of their technical knowledge. Hence, for small and mid-sized businesses that operate in silos, full stack development is the best option. As such, a great deal of companies are making a concerted effort to hire full stack developers who are capable of creating an entire web application or website from the ground up without ever stopping.

### 1.2 MEAN Stack Development

A collection of JavaScript-based technologies known as MEAN Stack is used to create complex, responsive, and progressive websites and web applications. The MEAN Stack consists of Express.js, MongoDB, Angular.js and Node.js. In other words, MEAN streamlines and expedites the development process. Developers are in high demand because MEAN Stack is widely accepted across industries. The advantages of multiple compatible time optimization tools for system administration are enjoyed by the developers. In addition to ensuring that websites, web apps, and APIs are easily deployed, MEAN Stack developers also handle difficult development challenges. Since you can use these solutions to quickly build and implement high-performance digital solutions, MEAN stack consulting services are also in high demand. The MEAN stack is used by many large companies for their mobile apps, including Shutterstock, Tumblr, Forbes, YouTube, Flickr, and Paytm. These are this year's top MEAN stack projects. MongoDB: JSON files data is stored in this document-based NoSQL database. Express.js: A Node.js back-end web application. Angular: Best front-end web framework for running JavaScript code in the user's browser. Node.js: A JS runtime environment for JS backend application implementation.

### 1.3 MERN Stack Development

A well-liked JavaScript stack for development is called MERN. The newest technologies combined to create premium web applications is called MERN Stack. Many databases, libraries, frameworks, and other tools are used in the development of these applications. It consists of multiple open-source parts, including Node, ExpressJS, React, and MongoDB. JS framework. These elements support developers' work on the framework from beginning to end. Using MERN Stack is a powerful technology that is quickly gaining popularity. Included in the MERN Stack are technologies such as MongoDB, an open-source document-based database Express.js: This is a quick and simple Node.js web framework. A JavaScript library for the front end called jsReact is used to create Node.js user interfaces[2]. There are numerous parallels between the MEAN and MERN stacks. js: Based on the JavaScript engine found in Chrome V8, it is a JavaScript runtime that delivers it to the server. The sole distinction between the two stacks is that the MERN stack uses React for frontend web app development, whereas the MEAN stack makes use of Angular tools. MERN Stack-built mobile apps are used by numerous major corporations, including Netflix, DropBox, Instagram, Facebook, and WhatsApp.

## II. Benefits and Limitations

### ✓ Benefits of Full-Stack

**Versatility:** Full-stack developers can work on both client-side (front-end) and server-side (back-end) of an application, making them versatile and capable of handling different aspects of a project.

**Effective Team Communication & Management:** Full-stack developers can communicate more effectively with different teams, including designers, product managers, and other developers. This helps in bridging the gap between various roles in a development project. Full-stack application development reduces the hassle of hiring developers and makes team management easier. For development, you need to hire some developers. Therefore, smaller teams have easier communication, greater transparency, and a freer flow of ideas among team members.

**Faster Development:** Full-stack developers have the versatility to switch between multiple technologies as needed. With the ability to work on both ends of a project, full-stack developers can streamline the development process. They can easily switch between front-end and back-end tasks, which can result in faster development cycles.

**Expertise in multiple technologies:** Full-stack programmers have great knowledge and expertise in various technologies such as front-end, back-end, and databases.

**Faster Adaptability & Delivery:** Technology evolves rapidly, and full-stack developers are often more adaptable to changes. They can easily pick up new technologies and frameworks, making them well-suited for dynamic and fast-paced development environments. Full-stack web application development takes less time than other types of development because fewer developers are involved. Therefore, you can switch roles and complete your work within a specific time.

**Limitation:** While being a full-stack developer offers numerous advantages, there are also some limitations and challenges associated with this role such as Constant Learning curve, Resource & Time Constraints, Dependency on tools and Frameworks and Limited availability of developer.

#### ✓ MEAN Stack Benefits

##### Advantages of MEAN:

**Single Language (JavaScript):** MEAN stack uses JavaScript for both server-side and client-side development. This allows developers to use a single programming language throughout the entire stack, simplifying the development process and promoting code reuse.

**Full-Stack Development:** MEAN enables developers to work on both the front-end and back-end using a unified set of technologies. This full-stack development approach can lead to better collaboration among team members and more efficient development cycles.

**JSON for Data Transfer:** JSON (JavaScript Object Notation) is used as the data interchange format across the entire MEAN stack. This consistency facilitates seamless data transfer between the client and server, making it easier to work with data in a unified format.

**Asynchronous, Non-Blocking Architecture:** Node.js, the server-side runtime in the MEAN stack, is known for its asynchronous, event-driven architecture. This allows for handling a large number of concurrent connections efficiently, making it suitable for real-time applications and improving overall performance.

**Rapid Prototyping:** The MEAN stack allows for rapid prototyping and development of Minimum Viable Products (MVPs). The combination of a NoSQL database, a flexible server framework, and a robust front-end framework allows for quick iterations and testing.

**Faster development speed:** MEAN Web stack development allows developers to quickly build applications. This ability to build solutions faster is especially useful when developing an MVP version of your app.

**Limitation:** While the MEAN stack (MongoDB, Express.js, Angular, Node.js) is a powerful and popular technology stack for building web applications, it also has some limitations and challenges. Here are some common limitations associated with the MEAN stack are Learning Curve, Complexity for small projects, Size of Bundle, Angular Complexity and Scalability concern for MongoDB.

#### ✓ MERN Stack Benefits

##### Advantages of MERN:

**NoSQL Database (MongoDB):** MongoDB, a NoSQL database in the MERN stack, offers flexibility in data modeling with its document-oriented structure. This can be advantageous for applications with evolving data requirements and the need for horizontal scaling.

**JavaScript Throughout:** MERN utilizes JavaScript for both the front-end and back-end development. This consistency allows developers to use the same language across the entire stack, fostering better collaboration and code reuse. This uniformity enhances collaboration and efficiency.

**Node.js for Server-Side Development:** Node.js, a server-side JavaScript runtime in the MERN stack, enables the creation of scalable and high-performance server applications. Its non-blocking, event-driven architecture allows for efficient handling of concurrent requests.




**Express.js for Web Development:** Express.js, a minimal and flexible Node.js web application framework, simplifies server-side development in the MERN stack. It provides a set of features for building web and mobile applications, streamlining the creation of robust server-side applications.

**Scalable Testing & Development:** The MERN stack enables rapid development of web applications, making it well-suited for projects that require quick iterations and frequent updates. The combination of a flexible front-end library (React) and a versatile back-end (Node.js and Express.js) allows for efficient development. Applications built using the MEAN stack are easier to test than development tests. Also assume that the developer is using a cloud-based solution to develop and test the solution. This situation is easier than developing the same solution using other technologies.

**Limitation:** While the MERN (MongoDB, Express.js, React, Node.js) stack is a powerful and popular choice for building web applications, it also has some limitations and challenges that developers should be aware of Learning Curve, Isomorphic applications, SEO Challenges Scalability of MongoDB, Project Complexity and Limited Expertise.

Below table represents comparative key benefits of full stack vs. MEAN stack vs. MERN stack:

Table 1. key benefits of Full stack vs. MEAN stack vs. MERN stack

 FullStack	 M E R N	 M E A N
Cost Effective	An open-source framework	An open-source framework
Best-fit for Small and Medium Enterprises	Entire coverage of web development cycle	Combination of MongoDB, React, Node.js and Express.js
Oversees Design Infrastructure	Resistant to redundant grunt work	Developers can only be pro in JSON and JavaScript
Flexible	Model view controller(MVC) architecture support	Model view controller(MVC) architecture support
Easy Upgradation	Built-in extensive tool testing suite	Built-in extensive tool testing suite
Easy Switching Between Frontend and Backend	Offers 4-exceptional technologies	Covers complete web development cycle from frontend to backend with JavaScript

### III. COMPARISON BETWEEN FULL STACK VS. MEAN VS. MERN

These three web development stacks – Full-Stack, MEAN, and MERN – aligns best with your project’s requirements. Here we represents comparisons between all three stacks with various critical factors such as performance, user experience, security, Development Time, community support, scalability and predictability utilize under web or mobile application development.

#### Performance:

Full-Stack and MEAN are appropriate for moderately trafficked websites because of their comparable performance levels. However, because of its optimization for managing multiple requests at once, MERN stands out as the superior option for applications that need to manage a large influx of users, such as social networking platforms.

#### User Experience:

When it comes to producing a remarkable user experience, Full-Stack bespoke app development services lag behind. With the Full-Stack framework, it can be difficult to include features like animations, adaptable layouts, and scrolling effects because these aspects require additional code.

#### Security:

Because of its JavaScript core, MEAN takes the lead in security, offering superior protection against vulnerabilities. On the other hand, because MERN is a more recent arrival, it might take some time to identify and fix any security vulnerabilities.

#### Development Time:

MEAN reduces development time by reducing the amount of time spent on development, mainly because fewer programming languages are used. Full-Stack, on the other hand, requires more time because it uses different programming languages for the backend and front-end development.

#### Ease of Use:

MEAN’s programming model is simple, with fewer complex concepts and technologies. This makes it easy to use, even for those who don’t know much about JavaScript. Full-Stack, on the other hand, can be complex, and can be a challenge for developers who aren’t experienced with JavaScript.

#### Community Support:

Full-Stack has been around for a while and has strong community support. However, the MEAN community and the MERN community are also active and responsive, so you are sure to find the help you need.

#### Scalability:

MEAN and MERN feature scalability by using a single programming language for front-end and back-end components. In contrast, a full stack may need help dealing with a rapid influx of users, which can impact performance.

#### Productivity:

MEAN and MERN increase productivity by simplifying development with a single programming language. The full stack provides benefits for early stage debugging, making it easier to identify and fix problems, especially when using appropriate bug tracking tools.

#### Features:

MEAN excels by providing a comprehensive set of built-in features for caching, file uploads and downloads, real-time communication with Socket.IO, and out-of-the-box authentication/authorization functionality.




MERN is similar, but it is designed to overcome the limitations of MEAN in terms of flexibility in integrating different technologies in the web front-end and back-end aspects.

In addition, the full stack offers more features, but does not have the same level of integration.

**Full-Stack vs MEAN vs MERN: Comparison Table**

The comparison table of Full-stack vs. MEAN vs. MERN compares various factors of each framework. This can help you choose which is better for your business web app development.

**Table 2. Factor Comparison of Full stack vs. MEAN stack vs. MERN stack**

Factors	Full Stack  FullStack	MEAN  M E R N	MERN  M E A N
<b>Category</b>	Frontend, Backend Technology	Javascript Framework	Opensource JS Library
<b>Language</b>	Java, C#, Python, PHP, JavaScript, and many others.	TypeScript	Javascript, JSX
<b>Learning Curve</b>	Medium	Medium	Low
<b>App Architecture</b>	3 Tier Web Architecture	Component based	None
<b>Data Binding</b>	One way & Two way	One way & Two way	Only one way
<b>DOM</b>	DOM Regular	DOM Regular	Virtual DOM
<b>Scalability</b>	Medium	Medium	High
<b>Architecture</b>	3 Tier Web Architecture	Upgrading and managing the code	Smooth UI Rendering
<b>Architecture Type</b>	Monolithic	MVC	Flexible(MVC)
<b>Productivity</b>	Better	Better	Low
<b>Third-Party Support</b>	Offers various libraries such as jQuery, LESS, etc. Or Varied	Offers different ready to use features or Extensive	Requires additional libraries for supporting similar requests or Extensive
<b>Features</b>	High Level	Moderate Level	High Level
<b>Security</b>	Medium Good(Javascript)	High (Excellent Javascript)	Medium Good(Javascript)
<b>Community Support</b>	Strong	Active	Active
<b>Ease of Use</b>	Complex	Simple	Moderate
<b>Development Time</b>	Moderate	Short	Moderate
<b>User Experience</b>	Limited	Moderate	Moderate

**IV. CAREER OPPORTUNITIES:**

Future IT solutions offer an excellent career where every day is filled with great excitement and unmatched growth. IT industry leaders guide in creating next-gen IT solutions by using the latest tools and technologies.

For the web development project, you should select a well-known and well-liked technology stack. But if you choose a well-known stack technology, you'll find more adaptable developers because they will be more familiar with it. Listed below are a few of the most popular titles right now.

- Full stack Developer (Angular & Node)
- Fullstack Developer (React and Node)
- .NET Full stack developer
- Java Full Stack Developer
- Full Stack Developer (PHP, Node, Angular)
- Full Stack Developer (MERN)
- Django Full Stack Developer
- MERN/MEAN Stack Developer

As a MERN/MEAN Stack Developer, he/she will be responsible for designing, developing, and maintaining robust and scalable web applications. They will work closely with the product team to translate their requirements into technical solutions, implement new features, and ensure the application's overall performance and reliability.

**Roles & Responsibilities as a Full/MEAN/MERN Stack Developer**

• **Full stack development:** Frontend and backend of web applications using MERN (MongoDB, Express.js, React.js, Node.js) or MEAN (MongoDB, Express.js, Angular, Node.js) Design and implement components[1].

• **Database Design and Management:** Create and manage databases for efficient data storage, retrieval, and data integrity.

• **API Development:** Develop RESTful APIs that facilitate communication between front-end and back-end components of applications.

• **Front-end development:** Build responsive and user-friendly UI components using modern front-end frameworks (React for MERN and Angular for MEAN).

- **Backend Development:** Implemented server-side logic and business logic using Node.js and Express.js (both MERN and MEAN).
- **Code testing and debugging:** Thoroughly test your application to identify and resolve errors and optimize performance.
- **Deployment and Maintenance:** Deploy the application into production and provide ongoing maintenance and support.
- **Collaboration:** Collaborates with cross-functional teams including designers, product managers, and other developers to deliver quality products.

#### Salary of Full stack vs MEAN stack vs MERN Stack

In the world of web development, choosing between a full stack, a MERN (MongoDB, Express.js, React, Node.js) stack, or a MEAN (MongoDB, Express.js, Angular, Node.js) stack is a big decision. An important factor to consider is the salary associated with each batch. Average incomes and salary ranges for developers working on the Full Stack, MERN, and MEAN stacks.

In India, the national average salary for a **Full Stack Developer** is ₹582,659 per year.

For fresher developers starts from ₹375,000 and those with 1-4 years of experience earn around ₹553,006.

Intermediate level professionals (5-10 years) can expect to earn between ₹1,000,000 and ₹1,500,000 per year.

**MERN Developer** average salary is ₹800,000 per year. Entry-level positions start from ₹550,000 and experienced developers can earn up to ₹1,600,000 per year.

**MEAN Stack developers** in India earn between ₹530,000 and ₹640,000 annually. Freshers (0 to 2 years) can earn between 370,000 and 500,000 rupees per year, those with 4 to 6 years of experience can earn between 680,000 and 920,000 rupees, and professionals with 8 to 10 years of experience can earn between 1.5 million and 2.2 million rupees per year.

#### **V. VISION, CHALLENGES AND FUTURE SCOPES:**

Developers can now create more powerful web applications by combining front-end and back-end technologies. Developers can work in multiple environments simultaneously, such as front-end and back-end.

This brings greater benefits to businesses, allowing them to do more work with fewer developers instead of hiring more developers to complete tasks for different parts of a web application[5]. Knowledge of multiple platform stacks like Full Stack, MEAN Stack, MERN Stack, etc. will help you understand the project easily and get accurate output, which will bring more benefits to your business.

Even small teams can achieve significant benefits compared to large teams by avoiding more communication and resource allocation. Stack Web Development salaries are increasing all over the world as the demand increases day by day. The future is also very bright as developers can add many new features and plan further challenges.

#### **VI. CONCLUSION**

Due to the popularity of Web Applications in the modern world, Stack developers are in high demand these days. For a variety of reasons, businesses prefer to hire them. Full Stack, Mean Stack and Mern Stack are capable of working concurrently in front-end and back-end environments. Instead of hiring a large number of developers to work on every aspect of websites and applications, it allows businesses to get a lot of work done by a small number of professionals, resulting in huge profits. Possessing an understanding of various platform stacks, including MEAN, MERN, and others. Full Stack, Mean Stack and Mern Stack can work on the project with ease and produce the necessary results for the company's benefit.

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