A Comparative Study between Angular Material and PrimeNG, for Angular 7

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Abstract: *The aim of this study is to compare two of the most popular UI (User Interface) component libraries available for Angular 7, which is a very popular framework for web application development. Choosing a UI component library is necessary and can be difficult given the surplus of choices for Angular 7, as it is not recommended to use more than one UI component library at a time in order to avoid conflict in design patterns. The selection of a good UI component library will provide effortless performance of components in the website with very little programming, predefined CSS (Cascading Style Sheets), and attractive themes for a better user experience. In this paper, we will see the various aspects of these two UI component libraries. The comparison between the two will be done based on various parameters that can help developers decide which UI component library will be better suited for different projects.*

Keywords: UI (User Interface), Angular Material, PrimeNG, styling, PrimeTek Informatics, Google, npm (Node Package Man- ager), API (Application Program Interface)

1. Introduction

We live in a world where everything has moved online, including most businesses, transactions, and services. People from any part of the world access these businesses through their websites. These applications can help grow businesses tremendously. The website of a business is used to make the customer realize the authenticity, mission, goals, and vision of the business.

Such web applications have become the strategic fronts for businesses; hence, they need to be planned well. Web applications have become an indispensable part of businesses. Hence, their development requires a vast understanding of evolving technologies and frameworks.

Angular 7 is one such web development framework that is very popular. Angular 7 has many more features compared to it's predecessor, Angular 6. CLI (Command-line interface) prompts, better performance, Ivy progress, Angular elements, Angular compiler, better and updated documentation, and most importantly Angular's own UI component library, Angular Material.

1.1 Introduction to Angular Material

Angular Material is a UI component library that is created by the developers of Angular 7, that is, Google. It's ultimate goal and function is to create attractive, functional, and easy to use UI components. It is used to create beautiful and modern web designs that are responsive and degrade gracefully. Angular Material takes inspiration from Google Material Design. Angular Material promotes a very minimal, simplistic, and flat design [5].

1.2 Introduction to PrimeNG

PrimeNG is a UI component library that is created by PrimeTek Informatics. PrimeTek Informatics is a vendor with a lot of expertise and experience in developing open source UI solutions. It is like a sibling to the PrimeFaces UI component library. The Widgets contained within the library are open-source, therefore are free to use under the MIT licence. This library not only provides multiple free themes, but also a plethora of premium themes available with a lot more UI variations available for a price on their official website.
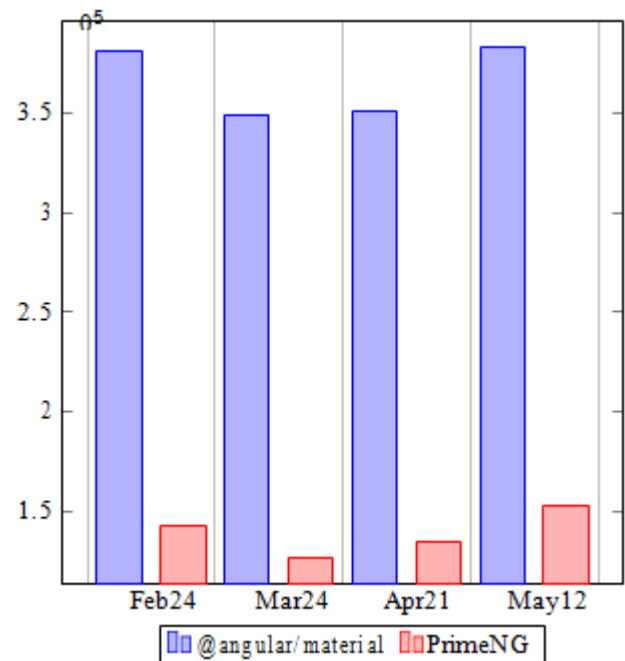
Figure 1: Number of downloads for both library packages from 24th February, 2019 to 12th May, 2019 [6]

2. Usage and Popularity

As we know, Angular Material and PrimeNG are both available on the official website of npm (Node Package Manager) and can be installed by running a simple install command. The number of times an application is downloaded via npm is tracked. We can view the statistical data pertaining these two libraries on the official

website of npm trends.

Fig. 1 displays a graphical representation of the number of downloads of both packages from npm, using the website for npm trends. The data for this website comes from npm's api (application program interface) called download counts. The details of packages are obtained from the npms.io API.

Table 1: Statistics for Angular Material and Primeng

Libraries	Version	Licence	Open issues	Pull requests
Angular Material	7.3.7	MIT	1510	275
PrimeNG	7.1.3	MIT	810	22

These statistics were recorded in May, 2019[7][8].

2.1 Usage and popularity of Angular Material

As we can clearly see in Fig. 1, according to npm trends, Angular Material is preferred by more people, compared to PrimeNG. This may be a result of the fact that Angular Material is developed by the same team that developed Angular 7. It may also be due to the simplistic and minimal design of the library[5]. Angular Material is very easy to use, and required minimal coding, which may attract programmers that are beginners. On the other hand, Angular Material has a high number of open issues, as shown in Table 1, which is problematic if the developer wants to use components for implementing complex functionality. In contrast to PrimeNG, the numbers of pull requests are several times higher. This could be interpreted as a plus, if interpreted as: Angular Material has a larger community and a major portion of the community is willing to make contributions to the library's development, it can also be interpreted as a minus, if interpreted as: the library needing multiple contributions on account of not having enough functionality being provided to begin with.

2.2 Usage and popularity of PrimeNG

As we can interpret from Fig. 1, according to npm trends, PrimeNG is less popular, compared to Angular Material. This may be a result of the fact that PrimeNG can be a little inefficient when it comes to the actual performance of the components. This library majorly focuses on designing and a beautiful appearance in the web application, as opposed to simplicity and performance. A lot of variation in the components allows users to build complex functionality easily. This reflects in Table I, as there are lesser open issues with this library. The numbers of pull requests are very low, compared to those for Angular Material. One interesting detail would be that PrimeNG only encourages pull requests that help fix bugs or expose the community to newer properties available in components, and discourages pull requests for newer features in components.

2.3 Components

From Table II, we can determine the number of components available without the varied grid component features, and the variations in grid components in each library. The numbers of components available in a library determine how much functionality the developer can add to the web application just by using the preexisting components in the library, rather than having to program for them separately.

Of course, not just the number of components but, the combination of effective functionality, and usability is important in the components of the library in order to make the library suitable for the appropriate project.

Table 2: Number of Components

Libraries	Components excluding grid variations	Grid variations	Total components
Angular Material	32	3	35
PrimeNG	81	22	103

These statistics were recorded in May, 2019[3][4].

a) Components in Angular Material

As we can see in Table II, the number of components available in Angular Material without grid variations are a little above thirty. Although that number is not very low, in contrast to that of PrimeNG, the number of components in Angular Material seems insufficient. This may be an inconvenience to developers that are looking to add components to implement complex features in the web application. In these scenarios, the inadequacy of components may hinder the development of functionality, and the developer may have to explicitly add code for it, ultimately increasing the resources required for the project. In addition, adding extra features or modifications to a preexisting component is very difficult, especially if the developer is a beginner. However, modifying components is easier in Angular Material than it is in any other library[10]. A developer needs to be at an expert level in order to add to or customize these components. However, some would argue that the components have a simpler implementation as a result of Angular Material's design that is very simplistic and hence, be easier for a basic implementation.

b) Components in PrimeNG

Table II indicates that PrimeNG has components that are far greater in number than those available in Angular Material. This is due to PrimeTek Informatics, the creators of PrimeNG, being very experienced at creating UI component libraries such as siblings to PrimeNG, PrimeFaces that is built for JSF, and PrimeReact that is built for React. Most complex functionalities can be displayed well by using the preexisting components in this library. This reduces the resources required to develop complex functionalities. With many components, the need for the proper documentation arises. PrimeNG does not have adequate documentation for all of it's components and their variations. The developers may have to figure a few features on their own.

2.4 Grid Component and It's Variations

The grid can prove to be a critical component for web applications that are created for the sole purpose of displaying data and making it easier to access data in it's raw form as well as data as filtered by the user. Simply put, grids improve the structure of data. There are various filters that can be applied to data, like sorting in a specific order or selecting records

a) The Grid Component in Angular Material
As we can see in Table II, Angular Material has only three categories in grid variations, they are: table, pagination, and sorting. These components are drastically lower compared to

PrimeNG. These features are very limiting to what a data table can display and how much the user can manipulate and choose from the data being displayed. Another important feature in a data table is its ability to export the given table as an excel sheet, which is not available in Angular Material. Other packages are available on npm that provide this functionality, but that will also increase the dependencies in the project, if the developer has to keep installing newer packages instead of having it all available in the library. Angular Material may be a poor choice if a web application's ultimate aim is to provide data to it's users.

b) The Grid Component in PrimeNG
PrimeNG has a wide variety of options available when it comes to variations in data table features. One interesting feature is the data filter that allows the user to filter the data in each column. These filters can be in form of input boxes, dropdown lists, multiselects, calendars, etc. PrimeNG also allows user to manipulate data in the table directly from the web application, in the table. It allows row selections, where the developer can set listeners to the selection event. These selections can be for a single row or for multiple rows. PrimeNG also allows the user to export the filtered and unfiltered data. However, there is no way to add any styling to to the data being exported including the font style, size, and the width of created rows. Hence, may also need a separate package to export data, depending upon the user's requirements.

c) Themes and Templates
A theme is an important aspect of a web application from a user experience and design perspective. A theme makes sure that the components and layouts in a web application do not look or seem mundane. Templating data helps in customizing content hence, is an important feature in displaying data or components in a certain style. The way a web application is styled can be a critical point in the users acceptance. Pages that feel good, have a subtle style and theme, encourage the users to interact more with the web application, as opposed to mundane, flashy, or overcrowded pages drive users away or irritate them. We can see the statistics for themes available in each library in Table III.

Table 3: Number of Themes

Libraries	Free	Paid/Featured	Total themes
Angular Material	4	0	4
PrimeNG	8	19	27

These statistics were recorded in May, 2019[3][4].

d) Themes and Templates in Angular Material
All the themes available in Angular Material are free. However, they are still far less in number compared to the themes PrimeNG offers in total. Even if we just compare the themes available for free in both libraries, PrimeNG offers double the number of themes compared to what Angular Material offers.

e) Themes and Templates in PrimeNG
Most themes available in PrimeNG are available for featured users only. However, it still offers quite a few free themes. There is a considerable difference between the total number of themes PrimeNG and Angular Material, which makes PrimeNG more desirable from a user experience perspective.

In addition, PrimeNG also allows templating of data.

3. Conclusion

Using more than one UI component library in a web application may create design pattern issues, which is why it is avoided. This is what makes choosing the perfect UI component library critical. There are many popular UI component libraries, two of which are Angular Material and PrimeNG. Different libraries suit different types of web applications hence, the selection of one can be done based on various parameters.

Angular Material was developed by the creators of Angular 7. It has a very simplistic design. The components work with fluidity to them. This library is a little lacking when it comes to variations in components and themes. The primary focus of the library is performance and not themes or styles. It is still the most widely downloaded library from npm. The documentation provided is very effective and clarifying.

PrimeNG was developed by a more experienced UI component development company. This library is full of components and has a lot of variations in most of it's components. There are ample themes to choose from, free and featured. This library can prove to be sufficient without having to install any other libraries or packages. However, the documentation is inadequate making it unfriendly to users, especially beginners.

Both of these libraries have their own perks of selected for the right we application. Angular Material can be selected where performance is prioritized more than the overall look and feel of the components, whereas PrimeNG can be selected where themes, styling, and varying functionality implementation is preferred. Angular Material is user friendly and can be used by beginners; it is also preferred by a lot of experienced developers as it is highly customizable. PrimeNG can be used by experienced developers that would want to apply complex functionality with style, without having to customize or code for most of it.

4. Acknowledgment

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