

Usage of Angular from developer's perspective

Based on a literature and empirical study

Emma Thorén

Filip Brännlund Stål

This thesis is submitted to the Faculty of Computing at Blekinge Institute of Technology in partial fulfilment of the requirements for the degree of Bachelor in Software Engineering.

Contact Information:

Authors:

Emma Thorén

E-mail: emmtho9518@gmail.com

Filip Brännlund Stål

E-mail: filip.brannlundstal@gmail.com

University advisor:

Mikael Roos

Department of Computer Science and Engineering

Abstract

Usage of frameworks is a crucial technology to be successful in developing business, Angular has exploded in usage because of its unique features. To give an as accurate knowledge as possible this essay contains a literature study of reliable references. The essay also contains an empirical study based on developers own perspective of Angular. With the help of this essay you will have the opportunity to choose which version of Angular suits your company best. With help from our responders we understand that Angular 2 is efficient and unique framework, we believe it will take Angular 2 a few years to be a standard technology at companies.

Keywords: AngularJS, Angular 2, developer's perspective

Table of contents

| | |
|---|-----------|
| 1. Introduction | 5 |
| 2. Research Questions | 6 |
| 3. Method | 7 |
| 3.1 Literature study | 7 |
| - <i>Search method</i> | 7 |
| - <i>Criteria</i> | 7 |
| 3.2 Empirical study | 7 |
| 4. Result | 9 |
| 4.1 Literature Review | 9 |
| - <i>General information about Angular</i> | 9 |
| - <i>Backwards compatibility</i> | 9 |
| - <i>Benefits upgrading to Angular 2</i> | 10 |
| 4.2 Survey result..... | 12 |
| - <i>General questions</i> | 12 |
| - <i>AngularJS and Angular 2 developers</i> | 12 |
| - <i>Angular 2 developers</i> | 14 |
| - <i>AngularJS developers</i> | 15 |
| - <i>Where did you learn about Angular?</i> | 16 |
| - <i>Not developed with Angular questions</i> | 16 |
| - <i>Overall questions</i> | 17 |
| 5. Analysis | 19 |
| 6. Conclusion | 22 |
| 6.1 General information about Angular..... | 22 |
| 6.3 Developers thoughts on Angular 2 | 22 |
| 7. Future Work | 24 |
| References | 25 |
| Appendix A | 26 |
| Appendix B | 27 |

1. Introduction

“Time is money” is a common expression within development. Developing web application nowadays consist of more than just code. Frameworks is the key to this success, it provides the developers with built in function to save time and money.

Now that Angular 2 has been released, our expectations are that AngularJS developers doubt if they shall migrate to Angular 2. And if they should migrate their current developing AngularJS applications to Angular 2.

This study comes handy if a company developing web applications has long been thinking if they shall start using Angular as a developer tool. Their only problem is, shall they use AngularJS to have a stable platform with lots of open source code to use, or shall they think new and use Angular 2 with a brand-new platform, new functions and not much available open source code to reuse.

This thesis will explain what Angular is, what developer’s thoughts on Angular are and which Angular version the developers recommend using.

This study requires no pre-existing knowledge in Angular, therefore an overall knowledge will be delivered for those who would like to know just the basic differences in AngularJS and Angular 2 and why Angular was created and who created it.

2. Research Questions

RQ1. What is Angular and why was it created?

This question is mainly focus for developers who are interested of developing in Angular or don't know what Angular is. Therefore, this study contains general information about Angular and offer the reader a pleasant start into the framework. This question will be answered by doing a literature study.

RQ2. What benefits are in Angular 2 and why is Angular 2 not compatible with AngularJS?

The goal of RQ2 is to get knowledge of the compatible differences between AngularJS and Angular 2. Another goal is to understand why the creators have decided to not make Angular 2 compatible and to get to know if there is a way to transform AngularJS to Angular 2 applications. This question will be answered by doing a literature study.

RQ3. What are developer's thoughts on Angular 2?

This question will be answered by doing a survey that will collect information from developers around the world to see what their thoughts of Angular 2 is. The reason why AngularJS developers don't upgrade to Angular 2 is interesting and will be asked in the survey. This question will be answered by doing an empirical study.

3. Method

3.1 Literature study

- Search method

The most efficient way of finding relevant sources came from result of search engines. Most of our references was found through Google Search Engine. When we had looked at any relevant source from Google result we turned into using other Search Engines such as DuckDuckGo and Yahoo.

- Criteria

To answer our research questions and provide the reader with correct and high quality information it is crucial to use reliable sources. If non-reliable sources such as Wikipedia are found we compare them with existing reliable references. When comparing them two and the content is the same and correct the reference is used.

3.2 Empirical study

The empirical part of this study will be answered by doing a survey, it will provide us with more material than if we would apply a literature study to answer what developer's thoughts on Angular 2 is.

To create an effective survey as possible, the form contains dependent questions from the answer of the question before. The survey is created with Google forms because it provides us with visual features to view the answers and study them individually. The form structure, questions and answers was first drawn up as a flowchart diagram before we build the form itself. This comes handy when dependent answers are used and the form structure get complex. [Appendix A]

The survey starts by first getting to know general information about the respondent, such as age, gender and where they live. Therefore, we will get information about where the survey was answered and an age difference to compare age and experience.

The responder then answer if they are familiar with Angular. We are only interested of responders that have heard or even better developed with Angular, therefore responders that have chosen that they don't know that Angular is will be taken to the end of the survey.

If the responder knows about Angular but have not developed in it we are interested in what they are using instead and the reason why they are not using Angular to develop with.

If the responder has developed with Angular, we are interested of what version they have developed with.

The responder is then asked how frequently their Angular version is used in projects. If the responder only has developed with AngularJS they may answer why they don't develop with Angular 2.

If the responder has developed with both Angular versions they should answer which of them they would choose to develop with.

Both the respondents that have developed with Angular 2 or both Angular versions may respond of what strengths and weaknesses they see in Angular 2.

All the responders that have developed with Angular should answer were they learned Angular. They then should answer if their company uses Angular to develop with in projects or the reason why they don't use Angular.

The survey will be published on LinkedIn, relevant Facebook groups and on Blekinge Institute University web programming community and reachable in five weeks to provide as much answers as possible. We believe with contributors all over the world the result will be balanced and not dependent from Sweden's contributors, therefore our goal is to receive answers globally.

4. Result

4.1 Literature Review

- Creation and purpose of Angular

Angular is a unique framework and it was created by Misko Hevery and Adam Abrons as a side project. [2] They spot a lack of features that existing framework didn't offer, other Model View Controller frameworks required the developer to code together the components, but they created Angular to do it for you. Angular uses Plain Old JavaScript Objects which improves the usage of an Object and makes it easier to add or change properties. The fact that dependencies are integrated in Angular makes it very simple to unit test components. [5]

Angular's features was unique and non-existing framework had these features. [2] Other frameworks like Ember and Backbone got virtually overtaken when Angular was published as an open-source framework. It totally exploded in population. [1] Misko Hevery developed a project at Google, the amount of code grew fast in the project and within a few months it was up to 17.000 lines of code. Hevery thought it was complex code and hard to test, he saw his opportunity and made a bet with his boss that he could create the same project with his and Abrons side project (Angular) within 2 weeks. Hevery failed recreating the project with Angular in 2 weeks instead it took Hevery 3 weeks and from 17.000 lines of code to 1500 lines.

At first Angular was released as a framework that users had to buy license for. At that time, Angular had very few subscribers and to increase the usage they decided to release it as an open-source library. [2]

After Adam Abrons with lack of interest stop developing on Angular Misko Hevery and Brad Green, his manager decided to further develop Angular to create a maintenance team with Google contributors to continue develop Angular.

One of the cones about Angular is that it is a framework developed by Google and has highly talented Google engineers to help developers solved their problem and a large open community is available for developers. [4]

Angular supplies developers with an efficient way to create single-page web applications, it also provides the developer with an end-to-end tool that will help web designers to develop both front-end and back-end. [3]

Angular is a JavaScript library and its purpose is to efficiently create front-end by using Model View Controller design pattern. [1]

- Backwards compatibility of Angular 2

Angular 2 was developed to increase the effective cost of features. AngularJS was developed on a platform where the features couldn't be further improved. Google decided to develop Angular 2 on a different platform to further extend the features and from that decision the compatibility between AngularJS and Angular 2 broke, but there are several ways to upgrade an AngularJS application. [6]

A safe way is to build the application using ngUpgrade while changing the components into Angular 2 structure. ngUpgrade allows the developer to run AngularJS and Angular 2 components together in the same application. The preparations before upgrading directories into components is a crucial part. The aim is to make sure the components are clean of unnecessary usage of services, the length of the application controllers shall be reduced and most importantly there shall only be one component per file.[7]

After preparing the code there are three approaches:

1. If the application is well written an approach like this would be the best solution. The application uses ngUpgrade and runs in hybrid mode. The pre-existing directives that are developed in AngularJS are brought closer to Angular 2 components and new components are written in Angular 2. That means that your application can both use AngularJS directives and Angular 2 components.
2. If the application is very simple and don't contain complex directives rewriting all the code is to be recommended.
3. Or a mix of approach 1 and 2 can be used, applying a balance between ngUpgrade and rewriting the code. Go through the directives one by one and decide to either rewrite the whole directive or bring it closer to Angular 2. This approach fits most organizations when large directives has been implemented and the choice of rewriting the all the directives is not an option. [8][7]

- Benefits upgrading to Angular 2

There are hundreds of thousands of different frameworks with the similar features. To be in the front lead everything is about speed. So, Angular 2 is focused on speed and effectivity. [9]

This features that have been improved during development of Angular 2. [10]

- **Server-side rendering**
Angular 2 applies server-side rendering instead of client-side rendering, this will decrease the loading time of the application. This is achieved by updating the content that has been changed. Think of a static webpage where the whole page should be reloaded when navigating through the page, this is where server-side rendering comes in handy. When navigating through an application that applies server-side rendering the content that has been changed is only reloaded, the other part of the application such as the navigation bar and footer is not reloading and then saves performance. [11]
- **More effective templating**
What was known as Controllers and \$scopes in AngularJS doesn't exist anymore. They are now known as components and directives. But components are directives with a template. A component must be imported on the page and be known by bootstrap. A directive can be declared by using the "@Directive" annotation, it can also be used in components for example, "NgFor". [12]
- **Improved support for mobile devices**
Angular 2 has been designed to better adjust to mobile devices using Hierarchical Dependency Injection system which improves performance significant. Angular 2 also provides a unidirectional tree based change detection that also provide effectiveness. [13]
- **Dependency injection**

Dependency injection is a design pattern that inherits in Angular 2, it's main responsibilities is to give dependencies to components instead of configuring them into the actual component. This is preferable when reusing, maintaining and testing components. [12]

4.2 Survey result

45 people responded to our survey and made it possible to make the result as accurate as possible.

- General questions

To get an overall knowledge about our responders they were asked to answer with their age, what gender they are, where they live and if they are familiar with Angular. [Appendix B.1, B.2, B.3]

To have an as accurate result of the survey as possible it is crucial to have opinion from all genders, ages and backgrounds. The responders that participant in the survey were 25% females and 75% are males.

The age of the responders is:

- 53,3% 18-25 years old
- 35,6% 25-35 years old
- 6,7% 35-45 years old
- 2,2% 45-55 years old
- 2,2% 55 years old or older

The majority of the responders are 18-35 years old. Angular is a younger framework and that may attract the younger generation.

When looking around the world it is interesting if the usage of technologies differs between countries, therefore it was prioritized to get responders from other countries than Sweden. Two American contributed in the survey and comparing their individual responses to the Swedish responses there are not any major differences.

Angular familiarity & knowledge

The responders are asked about their knowledge of Angular and the responses that was received was:

- 62,2% of the people have developed with an Angular version
- 35,6% have heard but not developed with Angular
- 2,2% have never heard of Angular

The focus of the survey is to see what developer's thoughts of Angular are, especially Angular 2. Therefore, those who are familiar with Angular are anticipated.

- 42,9% have developed with AngularJS
- 39,3% have developed both with AngularJS and Angular 2
- 17,9% have developed with Angular 2

The majority of the responses had developed with AngularJS. The responders that have developed with Angular 2 or both versions are extra interested to get their opinion on Angular 2 and the ones that only have developed with AngularJS should respond the reason why they don't choose to develop in Angular 2. [Appendix B.4, B.5]

- AngularJS and Angular 2 developers

Responders that have developed with both AngularJS and Angular 2 must respond to how frequently they have developed in projects with the different versions.

Out of the responses of the first question about how frequently they use AngularJS in projects. The results follows:

- 45,5% are using AngularJS in less than 25% of the projects
- 18,2% are using AngularJS in 25% of projects
- 18,2% are using AngularJS in 50% of projects
- 18,2% are using AngularJS in 75% of projects

AngularJS is not common in every project. AngularJS is a few years old and in larger projects the technology used is not the newest for various reasons. [Appendix B.6]

Our second question is how frequently they use Angular 2 in projects, the results were as followed:

- 36,4% are using Angular 2 in less than 25% of the projects
- 18,2% are using Angular 2 in 25% of the projects
- 36,4% are using Angular 2 in 50% of the projects
- 9,1% are using Angular 2 in 75% of the projects

Comparing the usage of AngularJS and Angular 2 there is a difference, Angular 2 is more common and the majority are using Angular 2 to a maximum of 50% in every project. [Appendix B.7]

They then had to respond if they had to choose between AngularJS and Angular 2 which one they would use. 72,7% of the responders would choose Angular 2 and 27,3% would choose AngularJS. They are asked to motivate their choice [Appendix B.8, B.9]:

- *AngularJS - "Neither"*
- *Angular 2 - "I like the structure, and with typescript it becomes very organized and easy to understand"*
- *Angular 2 - "Typescript makes it easier to build and understand dependencies and corporations between different parts within the project"*
- *Angular 2 - "Overall better, typescript support, better structure and prefer observables over promises."*
- *Angular 2 - "I like that Angular 2 uses Typescript. Components and component generator in Angular CLI"*
- *Angular 2 - "It's a newer tech"*
- *Angular 2 - "More object oriented, typed and structured both in code and in the folders."*
- *Angular 2 - "Easy component structure"*

- Angular 2 developers

Responders that have only developed with Angular 2 had to answer how frequently they use Angular 2 in projects. The results follow:

- 40% are using Angular 2 in less than 25% of projects
- 20% are using Angular 2 in 25% of projects
- 20% are using Angular 2 in 50% of projects
- 20% are using Angular 2 in 75% of projects

Angular 2 developers are without a doubt not using Angular 2 in all projects. The majority are using Angular 2 in less than 25% of all projects which is not a high usage. [Appendix B.10]

Thoughts on Angular 2

To get a better perspective and more correct conclusion about the usage of Angular 2 they wrote their own thought about Angular 2, especially strengths and weaknesses.

The responds as follows:

- *"Too hard"*
- *"Fast and easy. Weakness it's still in beta"*
- *"Easy to get started, clear developer guides, two-way data binding"*
- *"Strengths, typings, encapsulated components, more organized. Weakness, nested components can be hard to handle."*
- *"Strength: object oriented programming makes it easier to build components and inject these into each other."*
- *"Weaknesses: longer build/test time. Overall quantity of code is higher because many small components are build instead of one large."*
- *"It is a little too much. I would like to be able to develop in plain javascript and not typescript for example, to get rid of a large amount of files.. It is possible to do so, but not simple"*
- *"good with encapsulation"*
- *"As strength is typescript, structure. Weaknesses is probably that it is still being changed and requires a lot of time to keep the latest version."*
- *"strengths: new, the future and great idea of splitting up the code."*
- *"weaknesses: many many files!"*
- *"That Angular 2 is not compatible with Angular JS"*
- *"Angular2 is a good solid framework but might be to big for smaller applications that only require specific features"*
- *"It's both a strength and a weakness that it is do typed. Sometimes one does only want to use a certain data without having a type which is harder in angular 2."*
- *"Not enough resources"*
- *"Strength: backed by Google. Relatively easy to use."*
- *"Weakness: Non-standard HTML bindings and attributes. Harder to set up than angularjs"*

Two different peoples were discovered, the ones that are very positive about Angular 2 and brings out the positive features while the negative persons that brings out very critical feedback. The negative responses are related to Angular 2 new features. [Appendix B.11]

- AngularJS developers

Responders that have only developed with AngularJS are asked how frequently AngularJS is used in their projects. The results as followed:

- 58,3% are using AngularJS in less than 25% of projects
- 25% are using AngularJS in 50% of projects
- 8,4% are using AngularJS in 75% of projects
- 8,3% are using AngularJS in 100% of projects

More than half of the responders are using AngularJS in less than 25% in project for developing. Out of the responses AngularJS is satisfying for the majority of developers. [Appendix B.12]

Thoughts on AngularJS

AngularJS responders are asked of their thoughts on AngularJS, [Appendix B.13] the result were as follows:

- *"I quite liked it. A lot of good functionality with working with dynamic data and updating data."*
- *"Super to develop smaller projects in."*
- *"It's OK. I wouldn't pick it for a new project."*
- *"Seemed useful at first, now there are other options."*
- *"Seemed really cool, liked the custom controls"*
- *"It's seems good. Very nice for interactive websites. I find that it's not that easy to learn if you're new to web programming though."*
- *"It's really handy and makes development a lot smoother!"*
- *"Easy learning curve"*
- *"Flexible and powerful"*
- *"Good to handle one page applications, easy to get into."*
- *"It was a bit tricky to get a hang of in the beginning with all the different parts doing different things but once I understood it I found it very useful and fun to develop in."*

The responses that was received are positive about AngularJS and its features.

To understand why they did not choose to learn or start developing in Angular 2. They are asked to freely write why they do not use Angular2. [Appendix B.14]

The responses as followed:

- *"New job and haven't needed a big framework yet."*
- *"We have been discussing it, but haven't yet really felt the need to."*
- *"Too much overhead, "magic", and TypeScript."*
- *"Never had a need for it."*
- *"haven't had any work projects"*
- *"When I used AngularJS for my project Angular 2 was not released yet."*
- *"It wasn't compatible with Grafana, where I initially used it"*
- *"Not stable"*
- *"Its not standard within the organization I'm working with. There is a lack of knowledge"*
- *"Heard that it should be quite big difference between angularJS and Angular2. Just haven't made the transition yet"*

The responders think it is too early to migrate from AngularJS to Angular 2.

- Where did you learn about Angular?

- 39,3% learned it through their company
- 35,7% learned it by themselves
- 17,9% learned it through school
- 7,1% learned it in another way

The majority of the responders that have developed with Angular have learned it from their company. [Appendix B.15]

- Not developed with Angular questions

Below are questions for the responders who have heard about Angular but not developed with it.

Why do you not use Angular?

- *"I do not think I need it to our Wordpress domains"*
- *"Seems like a somewhat bloated framework. What I have seen of Angular have not impressed me."*
- *"I don't like frameworks"*
- *"When evaluating libraries, I compared Angular with Polymer and preferred Polymer's adherence to upcoming web component standards. At the time, AngularJS 2.0 was also fairly new and there was a good deal of uncertainty from the developers I knew about whether it would be a viable framework going forward."*
- *"It's excessive for our needs"*
- *"Other frameworks looked more interesting"*
- *"No knowledge"*
- *"Have just not tried it out"*
- *"I have YET to learn angular but i'm planning to"*
- *"I'm a backend dev. Never felt the need to use it"*
- *"Because I dislike two-way data binding and Typescript"*
- *"I mostly work on backend and therefore have not used angular."*

The responses indicate that Angular is still fairly new, especially Angular 2. The majority of the responders don't have any knowledge, but some are interested in learning it. Another reason is that the developers haven't felt the need of the frameworks features. [Appendix B.16]

What do you use instead?

- *"React"*
- *"Wordpress"*
- *"Elm"*
- *"Standard PHP"*
- *"Polymer"*
- *"Just JS, jQuery and Ajax"*
- *"jQuery / Bootstrap"*
- *"Java or C"*

There are a lot of frameworks available, the ones that our responders use instead of Angular 2 are both new and old. The majority uses older techniques such as standard PHP and WordPress. The reason they are using an older technique is because it is too expensive and time consuming upgrading their systems and integrating Angular 2. [Appendix B.17]

- Overall questions

Below are questions asked for responders that have developed with Angular or know what Angular is. The majority are not using Angular 2 as a developing tool at their company. [Appendix B.19]

They are being asked if they are positive that their company doesn't develop with Angular 2. The majority don't want their company to develop with Angular 2. [Appendix B.20]

The ones that don't want their company to use Angular 2 has the opportunity to motivate their opinion why they are negative to Angular 2. The majority is that Angular 2 uses TypeScript and additional features that the responders aren't positive about. [Appendix B.22]

Responders that want their company to use Angular 2 are also given the opportunity to motivate why they want to use Angular 2.

- *"I want to see the difference between angularjs and 2"*
- *"Seems cool"*
- *"It seems like the good parts of AngularJS with some extra good parts. It seems more intuitive to use as well."*
- *"I like the structure it imposes."*
- *"Easier to build apps"*
- *"It seems useful if developing websites"*
- *"I Believe that it Will be the standard framework"*
- *"Since angularJS is basically version 1 of angular it will be better"*
- *"Because it's the latest and it differs a lot from AngularJS and it would be nice to learn that as well."*

It implies that developers are positive to use Angular 2. It is a new framework with improved features and the fact that Angular 2 is the latest version of Angular therefore they are curious to learn the framework and sees what it provides. [Appendix B.23]

The responders are then asked to motivate the reason why their company don't use Angular 2.

- *"Because we don't have the need for it."*
- *"We do not need it!"*
- *"Because we still believe AngularJS is sufficient"*
- *"I don't know, I don't make the decisions, but maybe because it's still too new"*
- *"I am a primary decision maker for the technologies my company uses."*
- *"We use React instead."*
- *"Perhaps it is too new. There is also no need at the moment."*
- *"No relevance for our use-cases"*
- *"None know how to use it and it's hard to get time to learn it"*
- *"Because it's too new."*
- *"The current angular 1.6 development stack is to well established among the senior developers."*
- *"It is pretty new and my company want to test it before applying it in real projects"*
- *"Just using regular JS mostly and then some jQuery and Ajax"*

- *"I am a student but as I said before, I don't think it would suit embedded systems."*
- *"I'm a consultant, but react is preferred because it is a smaller library, Angular is disliked because it is a larger thing to pull into a project"*
- *"Too unstable. But some projects are actually being switched from AngularJS to angular 2"*
- *"Lack of knowledge"*
- *"We work mostly in Grafana and there is no support yet"*
- *"The same as my personal reasons mentioned earlier."*
- *"Because the project we are working on started before Angular 2 came out."*

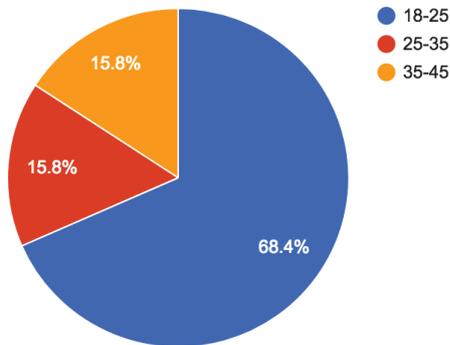
The majority of respondents believe that Angular 2 is too new, no time to learn the framework and that Angular 2 is not stable enough. A few responders believe other frameworks is a better option. [Appendix B.24]

The responders where their company uses Angular 2 have the opportunity to give their thoughts about it. Most of them are positive, one responder requested to work with Angular 2 and are very positive to it. [Appendix B.19]

5. Analysis

An analyse of the result of our survey provided us with how developers thinks and what they prioritize during developing with Angular. Out of the 28 responders 60,8% have developed with Angular 2, the amount of users developing with Angular 2 is more than we expected and the majority is 18-25 years old. The reason is that Angular 2 is new with improved features and the word "new" seems to attract the younger generations.

Angular 2 among ages

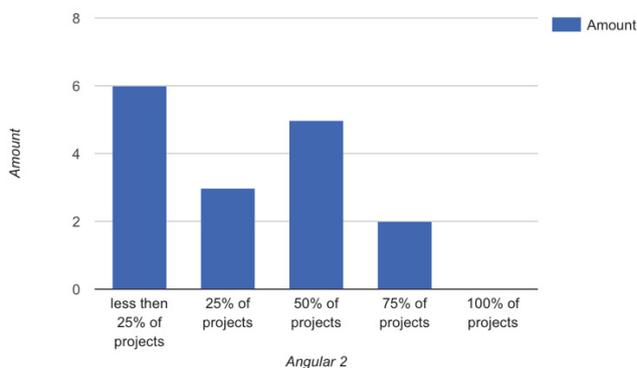


Picture 1: Age differences in usage of Angular 2

When creating the survey question "How frequent do you develop in Angular 2?", we predicted that responders are using Angular 2 at least 25% of their project. After an analyse of our survey we realized that Angular 2 might be used less than 25% of developer's project so we included it as an option to answer.

We asked our developers who had developed with Angular 2 or have developed with both AngularJS and Angular 2 how frequently they use Angular 2. According to Appendix A the question is asked separately to the responders. To receive an as accurate answer as possible we decided to summarize the results of the question answered separately by the both responders.

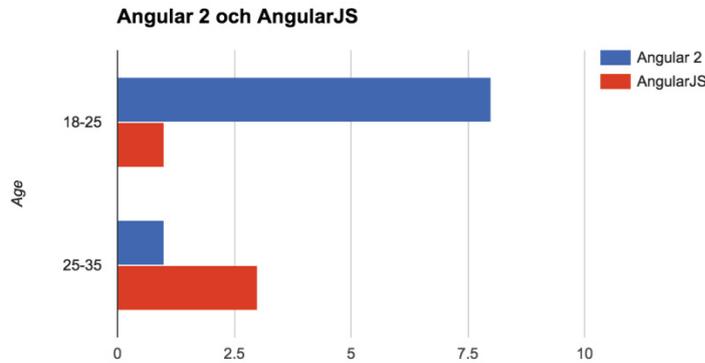
We predicted the usage of Angular 2 would be 50%-75%. According to **picture 2** the majority are using Angular 2 in less than 25% of projects. We believe the reason is that Angular 2 still is too new. It was not long ago that Angular 2 was released and it could take a couple of years for Angular 2 too be stable enough to use it in developing community.



Picture 2: The usage of Angular 2 in projects.

An interesting question we asked the developers if they would choose between AngularJS and Angular 2, which one they would choose to develop with. Our thoughts were that developers would choose Angular 2 because it contains new improved features. The result of this

question shows that our thoughts was correct. Where 72.7% would choose Angular 2 and 27.3% would choose AngularJS. We decided to do a deeper analysis of the responses choice to see the difference between their choice and age. The majority between ages 18-25 would choose Angular 2 while ages 25-35 would choose AngularJS. This shows that Angular 2 attracts the younger generation while the older generation feels safer with AngularJS.



Picture 3: Choices of version between ages.

When summarizing developer's thoughts of Angular 2 it is revealed that a strength is that Angular 2 is easy and fast to use, they also think that encapsulation in Angular 2 has been improved. On the other hand, the weaknesses are that Angular 2 contains too many files and it is not compatible with AngularJS. From analysing the strengths and weaknesses some responder are very critical towards Angular 2 and list weaknesses that reveals the feeling that they have not tried features that Angular 2 offers yet.

Example of negative weaknesses:

"Too hard"

"Still in beta"

"Not enough resources"

"Not compatible with AngularJS"

Which makes us believe there are more strengths than weaknesses in Angular 2.

The main reason why Angular 2 is not compatible is because it is developed onto a different platform than AngularJS. We believe offering compatibility between AngularJS and Angular 2 to further develop Angular 2's features is a necessary decision to make.

Even though the compatibility broke between AngularJS and Angular 2 the creators have put a huge amount time and effort to make AngularJS developers not lose trustworthiness and made it possible to migrate an AngularJS application to Angular 2.

The company that uses Angular 2 as a standard technology have a majority of employees that are satisfied. They believe it is positive for the company to stay updated in the ocean of frameworks and that they are overall satisfied with Angular 2's features. We think it will take a few years for Angular 2 to settle down and companies start to use it in regular bases. We believe from analysing the negative feedback about Angular 2 that companies use a certain

develop tool to integrate into their system. Integrating Angular 2 is not a piece of cake, therefore during the time upgrading the system a new tool will be used and hopefully it will be Angular 2.

We believe that one reason could be that the users are known to use a certain way of creating features and Angular 2 offers a new more efficient way of creating them. In Angular 2's perspective they want to provide the most efficient solution while it's hard for a developer to change coding behaviour. This is a temporary problem because Angular 2 is still new and developers have not gotten used to using Angular 2's new features.

6. Conclusion

6.1 General information about Angular

Angular is an effective framework created by Misko Hevery and Adam Abrons. It simplifies the creation of single-page applications and the collaborate between back-end and front-end.

Angular's features is unique and when Angular was published it exploded in usage.

At the time of developing Angular, Hevery was on a project where the application had 17.000 lines of complex code. He then betted with his boss that he could decrease the amount of lines to 1.500 in two weeks using Angular. It took him three weeks to complete it but his boss was satisfied with the work. Google was then interested in Angular's unique features and they started to further develop Angular on Google behaviour.

Angular 2 is focused on speed and effectivity. A few features that have been improved:

- Server-side rendering
- More effective templating
- Improved support for mobile devices

Angular 2 was developed on another platform to be able to improve these features, this broke the comparability between AngularJS and Angular 2. The creators have enabled the opportunity to upgrade an AngularJS project into Angular 2. There are 3 ways to accomplished that, but it requires the code to be clean, well structured and in hybrid mode with ngUpgrade.

After the preparation has been done an AngularJS project can be upgraded by doing either:

1. Enable hybrid mode and rewrite component after component until all has been converted.
2. Rewrite all code.
3. Mix of approach 1 and 2, run in hybrid mode go through each component and decide to rewrite the component or bring it closer to Angular 2.

6.3 Developers thoughts on Angular 2

A total of 45 individuals that contributed to our survey, the majority of them were between 18-25 years old. The gender is divided were $\frac{1}{4}$ are female and the rest male. The majority of responders were from Sweden. When asking responders after familiarity with Angular the usage and known factor was high. The majority have used and developed with Angular.

Responders who have developed with Angular 2 or both AngularJS and Angular 2 uses Angular 2 in less than 25% of their projects. If they had to choose between AngularJS and Angular 2 the majority would choose Angular 2 because it's new structure and improved features will facilitate them when developing in Angular 2. The strengths our responders think about Angular 2 is that it's easy to use and start developing with it, uses TypeScript, implies availability for encapsulation and that it's developed and supported by Google. On the other hand, the weaknesses that are brought up are that it's still in developing progress and things might change, not compatible with AngularJS and too much files and features. Usage of

Angular 2 within companies exist but far from common, the reason is that Angular 2 is still new and companies haven't had the time or waiting for Angular 2 to be more common before integrating the framework into their own system.

7. Future Work

An improvement of this thesis would be to reaching out to companies and interview the person that makes the decision on what technologies to be used for a specific project would be a good idea. To ask and get a more detail explanation on why they should use AngularJS or Angular 2 and what factors they look at when deciding to use different frameworks.

If companies choose other frameworks to use it can be interesting to know why they would choose not to use Angular and what pros they see with the different framework.

Analyse articles can be a complement to survey questions to get a more accurate conclusion than just rely on survey responses. It could be improved to collect more responses with the survey by trying to reach internationally and analyse if there are any differences between countries.

When we asked where the responders learned Angular, a few of them had learned it in school. It could be interesting to investigate school's opinion in Angular from a teaching perspective.

To deliver more general information about Angular and to more information about how Angular works and how it is set up the easiest way could be a complement to this thesis.

If this would be a bigger project, to try the different versions and deliver an analysis of how the different version work and witch one was to be recommended for different projects would be a good complement.

To interview a hand full of people to get more inputs on important questions could also be done. In that way, we could get more information about what a developer thinks are important differences between the versions of they have developed with the different versions.

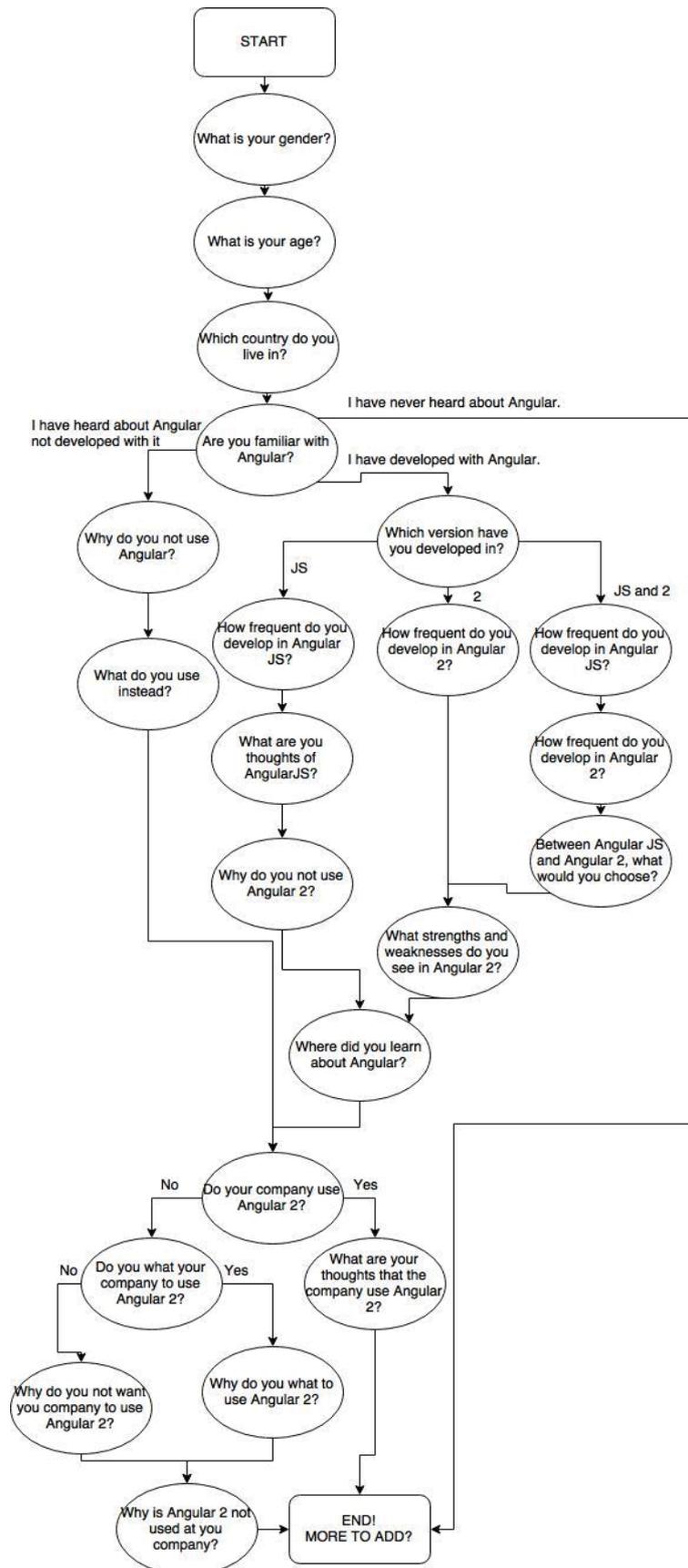
As this thesis focuses on people with no knowledge about Angular, it could be a good idea to analyse different references and tutorials for the different Angular versions and deliver a library with possible help that you may need as a developer.

Practical test on how to upgrade an AngularJS application to Angular 2 could be a complement to this thesis.

References

1. Treehouse, Is Angular JS the best front end development framework? Why?, <https://www.quora.com/Is-Angular-JS-the-best-front-end-development-framework-Why>, Quora, updated 2016-04-04, last gathered 2017-03-16
2. Wikipedia, AngularJS, https://en.wikipedia.org/wiki/AngularJS#Development_history, Wikipedia, updated 2017-03-03, last gathered 2017-03-16
3. Andrew Austin, An Overview of AngularJS for Managers, <http://andrewaustin.com/an-overview-of-angularjs-for-managers/>, Andrew Austin, updated 2014-08-27, last gathered 2017-03-17
4. Adam Conrad, 3 Reasons to Choose AngularJS for Your Next Project, <https://code.tutsplus.com/tutorials/3-reasons-to-choose-angularjs-for-your-next-project--net-28457>, Envatotuts+, updated 2012-12-26, last gathered 2017-03-23
5. Acadgild, 10 Reasons Why Google Created AngularJS and How It Will Change Your Career, <https://acadgild.com/blog/10-reasons-why-google-created-angularjs/>, Acadgild, updated 2015-05-15, last gathered 2017-03-23
6. Matthieu Lux, Why Angular has to break everything in the 2.0, <https://blog.zenika.com/2014/12/05/why-angular-has-to-break-everything-in-the-2-0/>, Blog Zenika, 2014-12-05, last gathered 2017-03-30
7. Carlos Taborda, Upgrading to Angular 2 now?, <http://www.gistia.com/upgradingtoangular2/>, Gistia, last gathered 2017-03-24
8. Angular, Upgrading from AngularJS, <https://angular.io/docs/ts/latest/guide/upgrade.html>, Angular, last gathered 2017-03-24
9. Pascal Precht, Upgrading Angular apps using ngupgrade, <https://blog.thoughttram.io/angular/2015/10/24/upgrading-apps-to-angular-2-using-ngupgrade.html>, Thoughttram, 2016-12-18, last gathered 2017-03-24
10. Shyam Seshadri, The Future of AngularJS, <https://www.oreilly.com/ideas/the-future-of-angularjs>, O'Reilly, 2014-09-17, last gathered 2017-03-24
11. OpenMyMind, Client-Side vs. Server-Side Rendering, <http://openmymind.net/2012/5/30/Client-Side-vs-Server-Side-Rendering/>, OpenMyMind, updated 2012-05-30, last gathered 2017-03-24
12. Eelco Muller, Angular 2 vs. Angular 1: Key Differences, <https://dzone.com/articles/typed-front-end-with-angular-2>, DZone, updated 2015-09-11, gathered 2017-03-25, last gathered 2017-04-06
13. S Sharif, Difference between Angular 1 VS Angular 2, <https://www.technicaldiary.com/difference-angular-1-vs-angular-2/>, Technical Diary, updated 2017-02-18, last gathered 2017-04-07

Appendix A

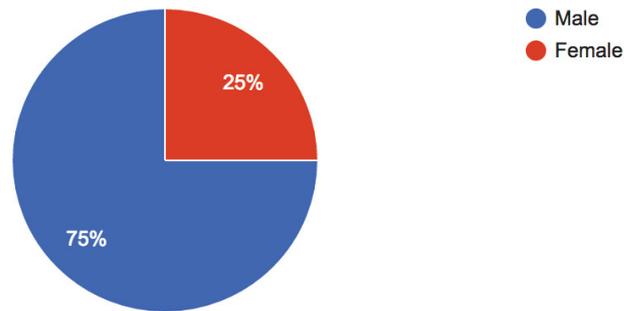


Appendix B

Appendix B.1

What is your gender?

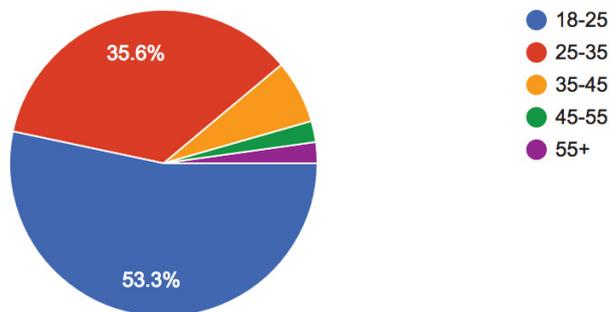
44 responses



Appendix B.2

What is your age?

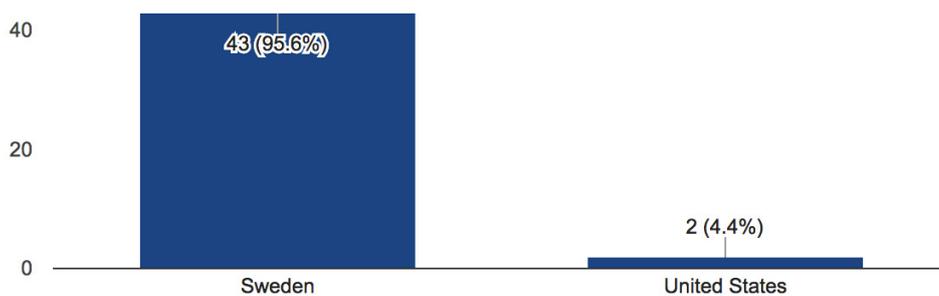
45 responses



Appendix B.3

Which country do you live in?

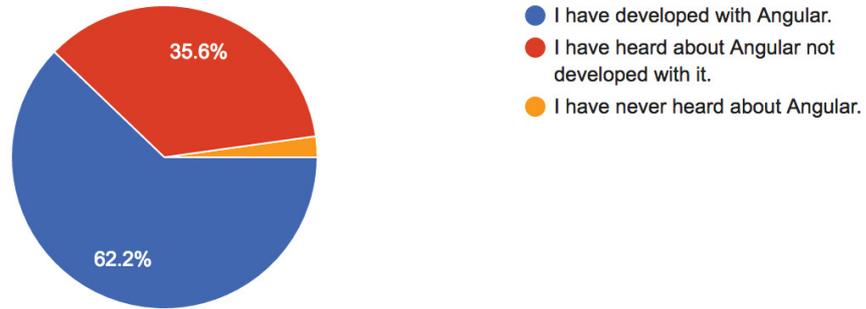
45 responses



Appendix B.4

Are you familiar with Angular?

45 responses

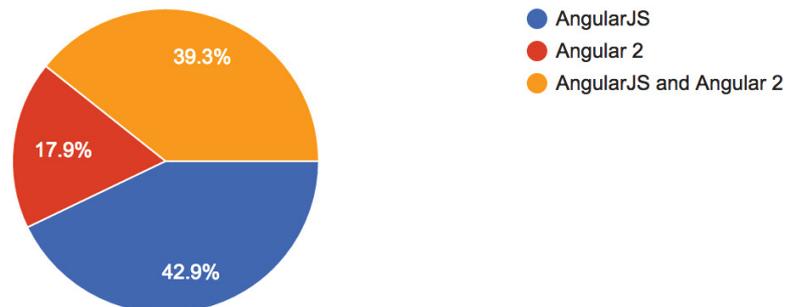


Appendix B.5

Version

Which version have you developed in?

28 responses

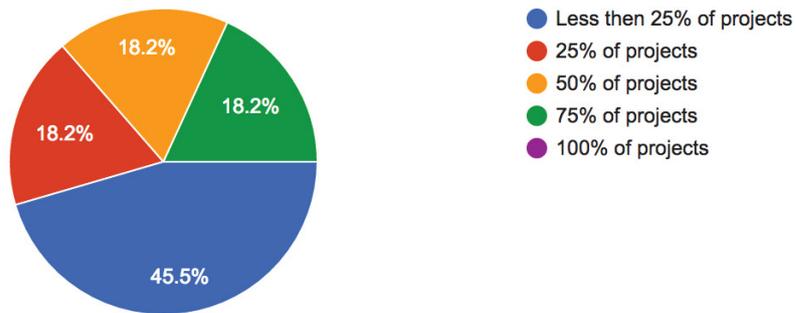


Appendix B.6

AngularJS and Angular 2

How frequent do you develop in AngularJS?

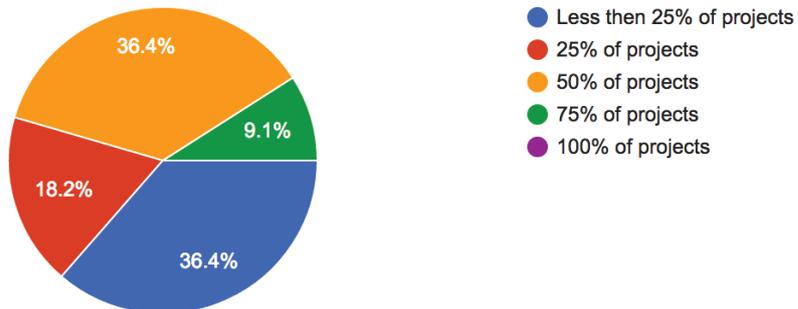
11 responses



Appendix B.7

How frequent do you develop in Angular 2?

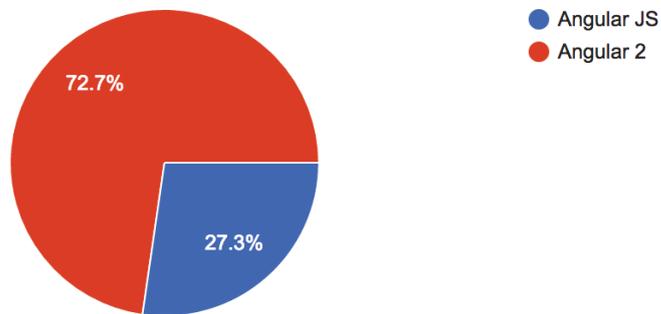
11 responses



Appendix B.8

Between AngularJS and Angular 2, what would you choose?

11 responses



Appendix B.9

Motivate your answer!

8 responses

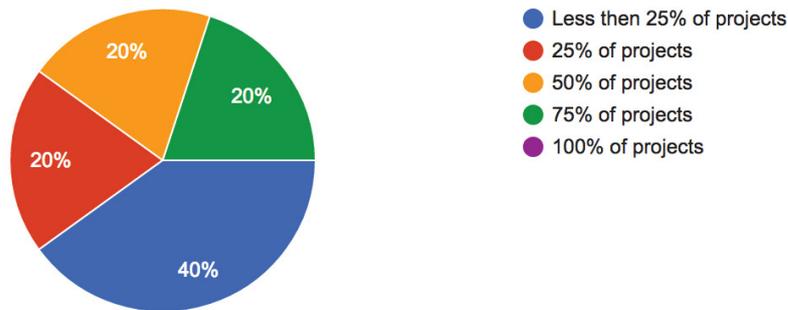
| |
|---|
| Neither |
| I like the structure, and with typescript it becomes very organized and easy to understand |
| Typescript makes it easier to build and understand dependencies and corporations between different parts within the project |
| Overall better, typescript support, better structure and prefer observables over promises. |
| I like that Angular 2 uses Typescript. Components and componentgenerator in Angular CLI |
| l'ts a newer tech |
| More object oriented, typed and structured both in code and in the folders. |
| Easy component structure |

Appendix B.10

Angular 2

How frequent do you develop in Angular 2?

5 responses



Appendix B.11

Thoughts on Angular 2

What strengths and weaknesses do you see in Angular 2?

14 responses

| |
|---|
| Too hard |
| Fast and easy. Weakness it's still in beta |
| Easy to get started, clear developer guides, two way data binding |
| Strengths, typings, encapsulated components, more organized. Weakness, nested components can be hard to handle. |
| strength: object oriented programming makes it easier to build components and inject these into each other. weaknesses: longer build/test time. Overall quantity of code is higher because many small components are build instead of one large. |
| As strength is typescript, structure. Weaknesses is probably that it is still being changed and requires a lot of time to keep the latest version. |
| strengths: new, the future and great idea of splitting up the code. weaknesses: many many files! |
| That Angular 2 is not compatible with Angular JS |
| Angular2 is a good solid framework but might be to big for smaller applications that only require specific features |

It's both a strength and a weakness that it is do typed. Sometimes one does only want to use a certain data without having a type which is harder in angular 2.

Strength: backed by Google. Relatively easy to use.

Weakness: Non-standard HTML bindings and attributes. Harder to set up than angularjs

not enough resources

good with encapsulation

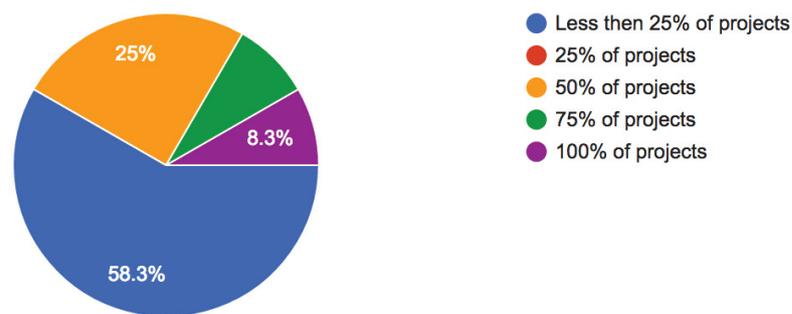
It is a little too much. I would like to be able to develop in plain javascript and not typescript for example, to get rid of a large amount of files.. It is possible to do so, but not simple

Appendix B.12

AngularJS

How frequent do you develop in AngularJS?

12 responses



Appendix B.13

What are your thoughts of AngularJS?

11 responses

| |
|--|
| I quite liked it. A lot of good functionality with working with dynamic data and updating data. |
| Super tp develop smaller projects in. |
| It's OK. I wouldn't pick it for a new project. |
| Seemed useful at first, now there are other options. |
| Seemed really cool, liked the custom controllS |
| It's seems good. Very nice for interactive websites. I find that it's not that easy to learn if you're new to web programming though. |
| It's really handy and makes development a lot smoother! |
| Easy learning curve |
| Flexible and powerfull |
| Good to handle one page applications, easy to get into. |
| It was a bit tricky to get a hang of in the beginning with all the different parts doing different things but once I understood it I found it very useful and fun to develop in. |

Appendix B.14

Why do you not use Angular 2?

10 responses

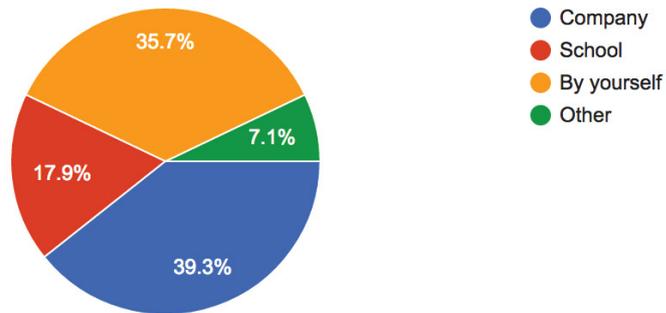
| |
|---|
| New job and haven't needed a big framework yet. |
| We have been discussing it, but haven't yet really felt the need to. |
| Too much overhead, "magic", and TypeScript. |
| Never had a need for it. |
| haven't had any work projects |
| When I used AngularJS for my project Angular 2 was not released yet. |
| It wasn't compatible with Grafana, where I initially used it |
| Not stable |
| Its not standard within the organisation im working with. There is a lack of knowledge |
| Heard that it should be quite big difference between angularJS and Angular2. Just haven't made the transition yet |

Appendix B.15

Continuation of Angular

Where did you learn about Angular ?

28 responses



Appendix B.16

Non Angular experience

Why do you not use Angular?

16 responses

| |
|--|
| I do not think I need it to our wordpress domains |
| Seems like a somewhat bloated framework. What I have seen of Angular have not impressed me. |
| Progressive Enhancement. |
| I don't like frameworks |
| When evaluating libraries, I compared Angular with Polymer and preferred Polymer's adherence to upcoming web component standards. At the time, AngularJS 2.0 was also fairly new and there was a good deal of uncertainty from the developers I knew about whether it would be a viable framework going forward. |
| It's excessive for our needs |
| Other frameworks looked more interesting |
| Worthless |
| No knowledge |
| Have just not tried it out |
| I have YET to learn angular but i'm planning to |

| |
|---|
| I'm a backend dev. Never felt the need to use it |
| I am not a web developer (yet?) |
| Because I dislike two-way databinding and Typescript |
| I mostly work on backend and therefore have not used angular. |
| why would i? |

Appendix B.17

What do you use instead?

14 responses

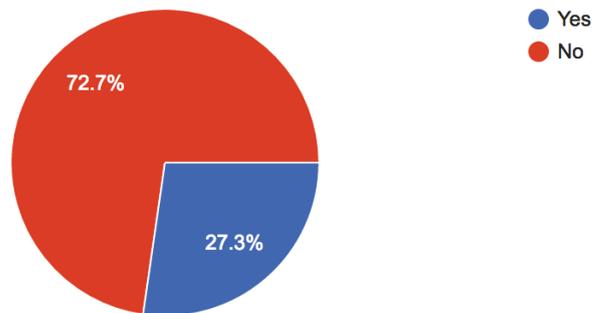
| |
|--------------------------|
| React |
| React |
| Wordpress |
| Elm |
| Progressive Enhancement. |
| Standard PHP |
| Polymer |
| react |
| Anything instead |
| ? |
| Just JS, jquery and ajax |
| JQuery / Bootstrap |
| - |
| Java or C |

Appendix B.18

Regarding your company

Do your company use Angular 2?

44 responses



Appendix B.19

What are your thoughts about that your company uses Angular 2?

12 responses

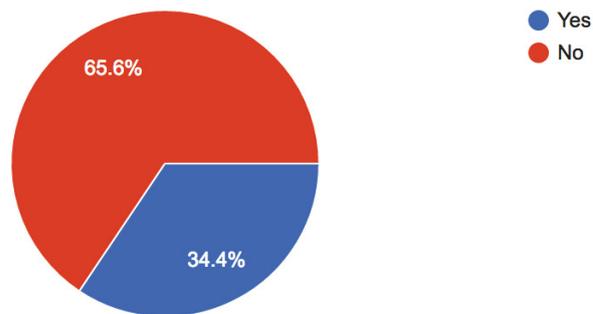
| |
|--|
| Awesome! |
| positive. It was my request from the beginning. So im happy to work with it. |
| It's great, stay updated! (I'm pretty sure the company uses Angular 2) |
| No thoughts |
| a |
| Great! |
| I like that they use Angular 2 and will be in the front of developing. |
| Good, i like using Angular2 |
| none |
| Seems pretty good and is used in several projects I have been working with. |
| Nice |
| no |

Appendix B.20

Regarding your company

Do you want your company to use Angular 2?

32 responses



Appendix B.21

Regarding your company

Why do you want to use Angular 2?

11 responses

| |
|---|
| I want to see the difference between angularjs and 2 |
| Seems cool |
| It seems like the good parts of AngularJS with some extra good parts. It seems more intuitive to use as well. |
| I like the structure it imposes. |
| Easier to build apps |
| It seems useful if developing websites |
| I Believe that it Will be the standard framework |
| Since angularJS is basically version 1 of angular it will be better |
| I don't have a company... |
| Because it's the latest and it differs a lot from AngularJS and it would be nice to learn that as well. |
| .. |

Appendix B.22

Why do you not want you company to use Angular 2?

21 responses

| |
|---|
| Sucks |
| Because i couldn't choose "no opinion" |
| We do not know that we as a community need Angular |
| Use something functional instead, cycle js, purescript with Halogen or Elm. |
| Progressive Enhancement. |
| I don't like frameworks |
| I prefer Polymer's adherence to web component standards |
| TypeScript, overhead, and "magic" (things going on in the background) |
| Then I have to learn it. |
| No need for the features it provides |
| Inhouse js framework |
| Worthless |
| .. |
| I chose no since there is no I don't know answer. I'm a backend dev so I'm not too familiar with what we're using front end |
| No particular reason, I just don't think it would suit embedded systems (which I am interested in). |
| Because it uses Typescript. React solves the same problems but in an easier way |
| , |
| If it is suited for the project sure, prefer react over angular 2 at the moment though. As it is a bit more stable. In a few month when Angular 2 is a bit older I would probably say yes to this question though. |
| It is a cool project but still too unstable and relies on beta versions and drafts of future implementations in TypeScript. Angular 2 is for personal projects while AngularJS, React or Polymer should be used in real applications. |
| ... |
| it just adds more dependencys when there is no need to |

Appendix B.23

Regarding your company

Why do you what to use Angular 2?

11 responses

| |
|---|
| I want to see the difference between angularjs and 2 |
| Seems cool |
| It seems like the good parts of AngularJS with some extra good parts. It seems more intuitive to use as well. |
| I like the structure it imposes. |
| Easier to build apps |
| It seems useful if developing websites |
| I Believe that it Will be the standard framework |
| Since angularJS is basically version 1 of angular it will be better |
| I don't have a company... |
| Because it's the latest and it differs a lot from AngularJS and it would be nice to learn that as well. |
| .. |

Appendix B.24

Regarding your company

Why is Angular 2 not used at you company?

32 responses

| |
|--|
| .. |
| .. |
| Too dumb developers |
| Bequase we donät have the need for it. |
| We do not need it! |
| Don't know, haven't come up. |
| Progressive Enhancement. |
| Because we still belive angular js is suffiecient |
| I don't know, I don't make the decisions, but maybe because it's still too new |
| I am a primary decision maker for the technologies my company uses. |
| We use React instead. |
| Perhaps it is too new. There is also no need at the moment. |

| |
|--|
| No relevance for our use-cases |
| Noone know how to use it and it's hard to get time to learn it |
| Idk |
| Worthless |
| Because it's too new. |
| The current angular 1.6 development stack is to well established among the senior developers. |
| It is pretty new and my company want to test it before applying it in real projects |
| ? |
| Just using regular JS mostly and then some jquery and ajax |
| I don't know |
| I am a student but as I said before, I don't think it would suit embedded systems. |
| I'm a consultant, but react is prefered because it is a smaller library, Angular is disliked because it is a larger thing to pull into a project |
| , |
| Too unstable. But some projects are actually being switched from angularjs to angular 2 |
| Lack of knowledge |
| We work mostly in grafana and there is no support yet |
| I still don't have a company |
| The same as my personal reasons mentioned earlier. |
| Because the project we are working on started before Angular 2 came out. |
| why wouldit be used? |