Stack Overflow Survey 2019: Job Satisfaction Analysis

ABSTRACT

Programming productivity is the measure of rating an individual programmers' capabilities and skills. Moreover, developers or programmer's performance in the organization majorly depends on balance of personal and professional life. Professional life also termed as work life is highly influenced by career path, career satisfaction, job profile and satisfaction with current job role. Job satisfaction exploration is necessary for identifying potential employee and improving work environment when working in a collaborative environment. This paper ideally targets those factors and tries to explore it in perspective to job satisfaction. Stack overflow conducts an annual survey every year which covers everything about the programmers and developers registered in this large community. Hence, this paper leverages this information to identify factors and parameters that creates an effective impression on fluctuating job satisfaction amongst the registered participants. It is an effort to study a developer's self-reported job satisfaction given their job history, programming experience, and other pertinent statistics. Adding to it, proposed study in this paper closely analyses the relationship among those factors and addresses it in respect to specific developer roles.

Keywords

Keywords: Stack Overflow; Job Satisfaction; Survey; Research

1. INTRODUCTION

Stack Overflow is the most popular and widely used platform for professional coders and programmers. Created under the name Stack Exchange Inc [2][3][4], Stack Overflow community is growing rapidly and every year new programmers registers themselves in this community. It is a Q&A platform which covers various topics across different domains. Users of this forum posts questions and other users provide solution to those questions. A rating-based system is facilitated in this forum that generates a score for users based on questions answers. This system is also called as upvoting or down voting. Users achieves perks from answering questions in form of reputation points and badges [1]. Developers and programmers in this community may not be from a technical background but are registered to this forum. Thus, stack overflow consists and creates a network graph with users from different background recognized as enthusiast programmers [1]. This makes the platform more favorable for data mining and analyses. Every year Stack Overflow conducts an annual survey. This survey is taken up by the users of stack overflow. Based on the response provided by the participants, data is analyzed to retrieve useful information. Started in 2011, each year with increasing developers, survey questions are changed in attempt to add more relevant and interesting questions for developers [5]. Survey includes more than 80 questions which tries to cover everything about the respondent's personal and professional aspect. Every subsequent year, questions in the survey are manipulated and added up to improve the quality of questions and to get some relevant information about the user.

Stack Overflow Survey 2019 is the latest survey conducted by the Stack Overflow. The number of respondents is in thousands as every year. Due to large count of survey results and widely accepted use of this website, data retrieved is of utmost importance when intended to do research in domain of programming or coding

languages. Majority of users on Stack Overflow are professional programmers or knowledgeable in programming concepts, use of tools and computing fundamentals. Major part of survey participants lies under above category and thus this data collected can be considered ideal for mining technical factors or trend in computing world seen throughout the year. Considering the survey questions, every year the set of questions constructed for participants covers majority of questions relevant to career, job and work life. Smaller portion of questions are related about user behavior and usage pattern of this forum. This inclination of questions largely towards work ethics and more about user regarding technical aspect makes the data susceptible to be mined and analyzed keeping this as the backbone of the study.

Stack Overflow Annual Survey 2019 has questions about open source developer, salary per annum, career satisfaction etc. This survey has a very interesting question asked from user about the job satisfaction. The survey also contains questions that highly impact on and support their decision on choosing the job satisfaction score. Idea proposed in this paper solely points to uncover factors and trend that stimulates their satisfaction decision. With more than 80 factors or questions that can be reasons for specific job satisfaction selection, this paper is tightly coupled with 5 research questions that influences the satisfaction selection criteria. These factors are essentially important amongst all other factors and from technical individual or from a computer programmer perspective clearly stands out as a vital parameter. The theme of the paper moves more in detail with analyzing developer perspective to job satisfaction. As per analyses about different job profiles, major participants declared themselves as front-end, back-end and full stack developers. This paper showcases the job satisfaction score and analyses with respect to the above-mentioned job roles.

The paper is organized as follows: Section 2 provides detailed procedure about the study of survey. It includes in depth explanation of choosing right research questions. Data collection and processing phase is been mentioned in this section as well. Section 2 also includes some general analyses about the survey results and how it's been changed when performed a comparative study using previous year results. Section 3 discusses about the results that provide strong evidence supporting the job satisfaction selection. Finally, we conclude the paper where we outline limitations of the study and anticipate extended or future work to this idea.

2. Methodology
2.1 Research Questions

We investigated the survey questions and found that the most interesting question was how a developer self-reported their job satisfaction. We decided that the other survey questions could be

used to find any correlation and predict the trend on basis of the information that was relevant and could be answered by any developer. Our study mainly revolves around % major question that are plausible when we want to score the satisfaction level in any kind of job

RQ1: "*How does Salary influence the Job satisfaction?*"

The first and foremost thing when we are looking for any job or when we want to switch the position is if new job is going to pay more. Salary is one of the key factors that influences at least at times of job selection. We will examine how increase in salary influences the job satisfaction level of a developer.

RQ2: "Impact of Age on Job Satisfaction criteria?"

Another interesting feature evaluated is age. How does the overall satisfaction level of any developer changes with the age? For this we considered different age groups 11-20, 21-30. 31-40 and so on.

RQ3: "Which Developers are more satisfied with their work?"

Then we took our research a step further and explored are there any set of developers that are more satisfied when compared to another. Also, age was also examined with the job profiles and job satisfaction level to know if there are any kind of exceptions when we only compared it with the age.

RQ4: "What does Working week hours has to do with Job Satisfaction?"

Another important question we really must consider is how many hours in a week developer spend in front of the screen. How many working hours they do have in a week and how does long working hours impact the satisfaction level of the developers. Another interesting finding would be is this trend only for a specific age group or it is something common for people of all ages.

RQ5: "Is Professional coding Experience related to Job Satisfaction?"

It is something important to know how a person feels when one gets used to all years of experience that a developer has gained through job. And how does particular developer feel after long years of working and how does this vary from other developers.

2.2 Data Collection and Processing

Stack overflow annual survey 2019 registered over more than 90000 respondents across the globe. Compared to 2018, the number of responses dropped by 20000. For this study, dataset was extracted from the official stack overflow survey website [5]. Data preprocessing step was major time-consuming section in this study before moving to analyses. Research questions outlined above has a separate column in the dataset. However, most of them were string inputs and comments and thus were needed to convert them into categorical data or value bins. We are inspecting specific developer type in this study hence developer type question responses were revalued as front-end, back-end, full-stack and others based on participants answers. Age column had large distribution with minimum age of 12 and maximum age of 80. Bins of age with difference of 10 was constructed for analyses. Other research questions also had specific columns as answers in numeric value. These variables are also structured in categorical data for

analyses. Workweek hours has 3 bins as 1-20 hours, 20-40 hours and greater than 40 hours. Years of professional coding experience is divided as categories of less than a year, 1-3 years,4-10 years,10-15 years and experience greater than 15 years. After cleaning and transformations, we had 70882 responses for evaluation.

2.3 Analysis

This part of the paper describes general analysis of the survey. It evaluates the responses based on country, job satisfaction responses, different job profiles registered in the survey, top programming languages and technical factors about the survey.
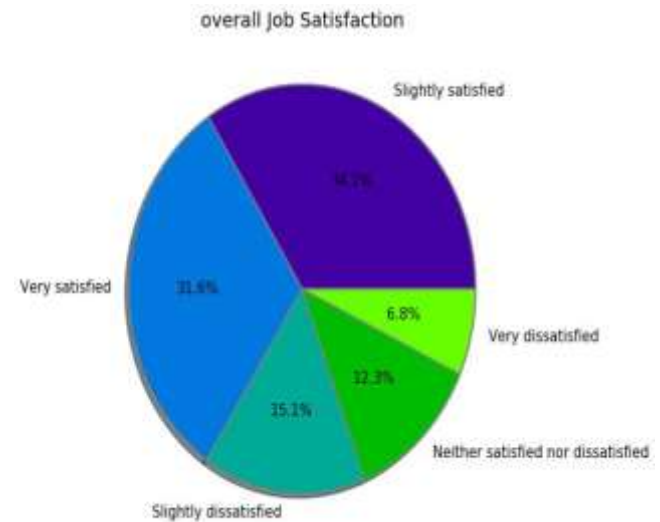

Fig 1: Job Satisfaction Count of Respondents

Figure 1 describes the job satisfaction question of the survey and as percentage of responses. This feature is divided amongst 5 categories namely very satisfied to very dissatisfied. Out of all the responses, very satisfied and slightly satisfied comprises of 31.6% and 34.1% respectively. This clearly indicates majority of participants are satisfied with their current job. We also have smaller portions of dissatisfied respondents as well which will be evaluated in following sections of paper.
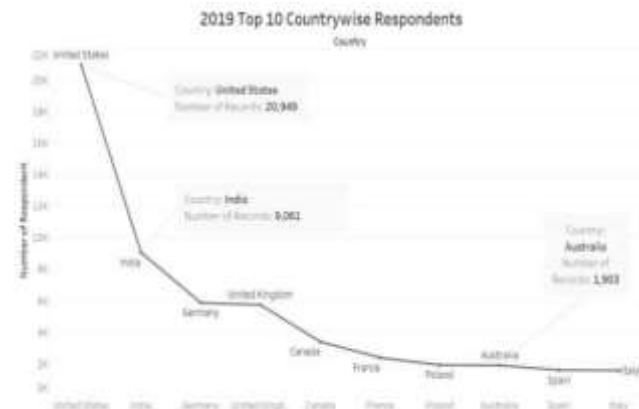

**Fig 2: Top 10 Country wise respondents**

Around 170 countries participated in this survey expect for Cuba, Iran, North Korea, and Syria [5]. Figure 2 describes about the top 10 countries with highest contributor to the survey. Compared to 2018 survey, India and United States are again the top countries

with highest contributors. United States count 30% whereas India count 12% of contribution.
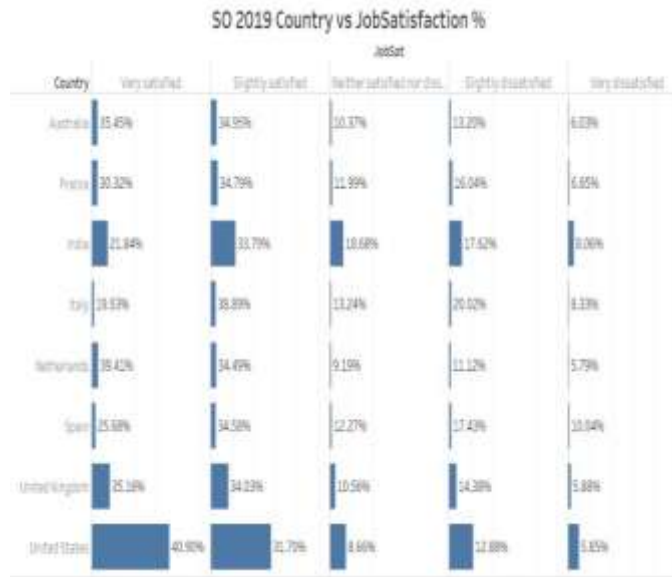

Fig 3: Job Satisfaction results distributed country-wise

Figure 3 gives a clearer picture of responses when filtered as country wise and job satisfaction. From the figure, depending on the count of responses from different countries, majority has marked them satisfied. However, if we evaluate dissatisfaction percentage, countries such as India and Spain show similar numbers as satisfaction.
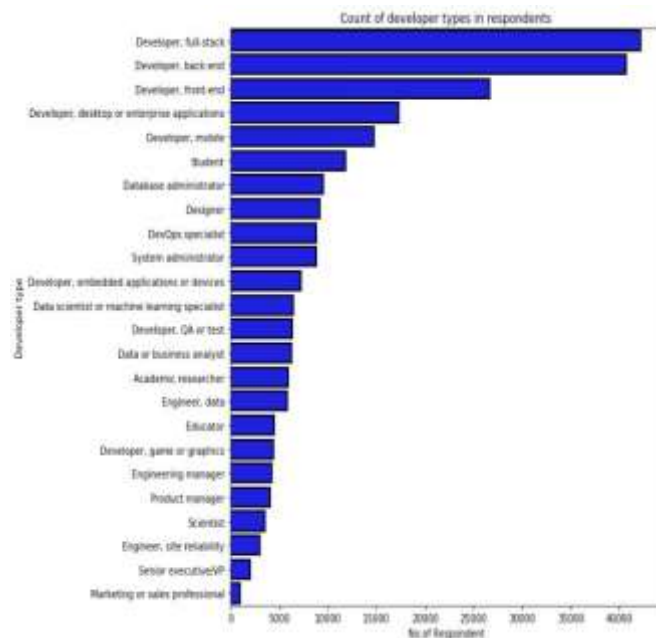

Fig 4: Job Profiles

Survey required respondents to register the job profile and job position they were working or have experience. Figure 4 describes about the different job profiles recorded in the survey. Top job profiles are developers as full-stack, back-end, front-end and mobile developers. Many respondents are students as well. Compared to 2018 survey results, these top job profiles are still at the same positions and is in demand in tech market.
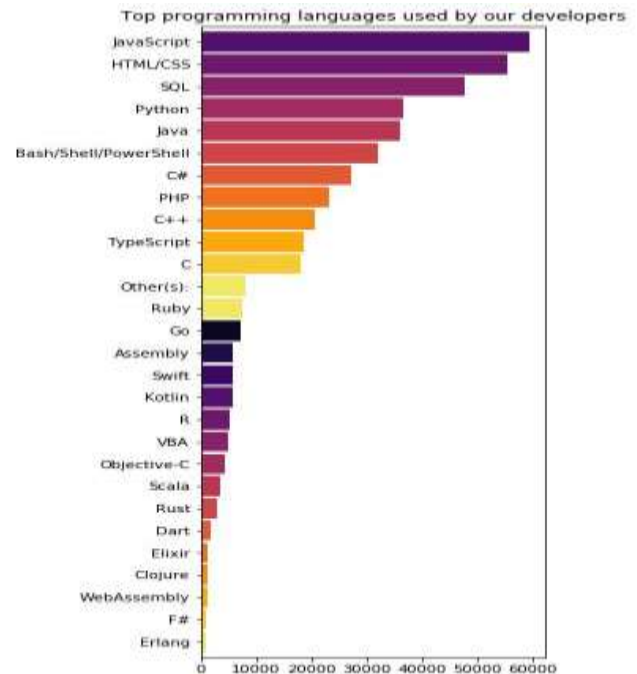

Fig 5: Top programming languages

Survey 2019 shows majority of developers working on programming languages such as JavaScript and Html/CSS. This can be anticipated by the count of developer roles as full-stack and front-end developers. Figure 5 shows the results of all programming languages used by community developers with their count.
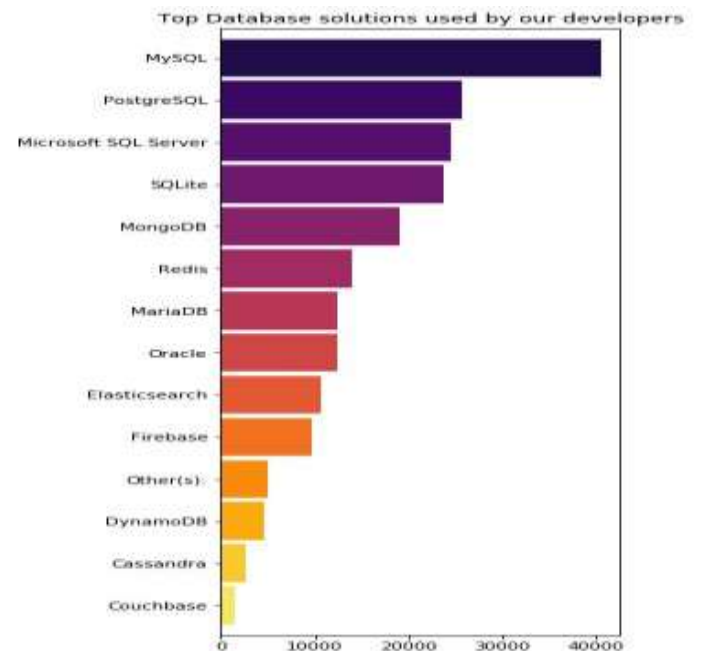

Fig 6: Top Databases platform

Figure 6 represents top databases used by developers with their count. Survey 2019 shows majority of developers working on databases solution such as MySQL and PostgreSQL.
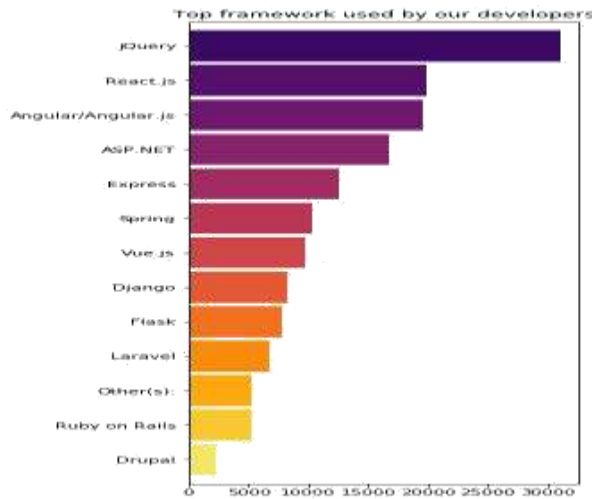
Fig 7: Top programming frameworks

Figure 7 shows the top programming framework used by majority of programmers. Top counts are jQuery, React.js and Angular.js. These top frameworks are related to full-stack, back-end and front-end developers. Compared to 2018 results, this year results do not show much changes when scrutinized for technical factors of developers
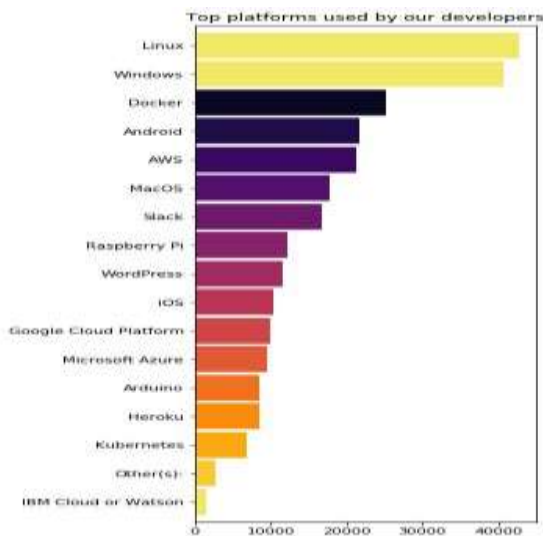
Fig 8: Top programming platforms

Figure 8 portrays the different platforms used by respondents in year 2019 with their count. Top platforms are Linux and Windows. Major platforms are from the domain of cloud computing such as AWS, Google cloud platform and Microsoft Azure.

3. Results

This section of paper explores the postulated research questions mentioned in Section 2. It provides a fascinating outlook to these factors and provides necessary evidence to support the proposed hypothesis. Every research question is been scrutinized and mapped with almost every other factor to showcase high correlation in the job satisfaction fluctuation if detected.

*RQ1***: *"How does Salary influence the Job satisfaction?"*

In order to find answer to this question we plotted job satisfaction and salary. We categorized the salary ranges from 0-20k, 20k-50k, 50k – 90k and more than 90k. It was interesting to know that more than 65% on average in every salary bracket were satisfied with a greater number of slightly satisfied developers in 0-20k and 20k - 50k and a greater number of people in very satisfied developers increasing in salary ranges 50k-90k and >90k. Therefore, salary does have some effect on the job satisfaction level.
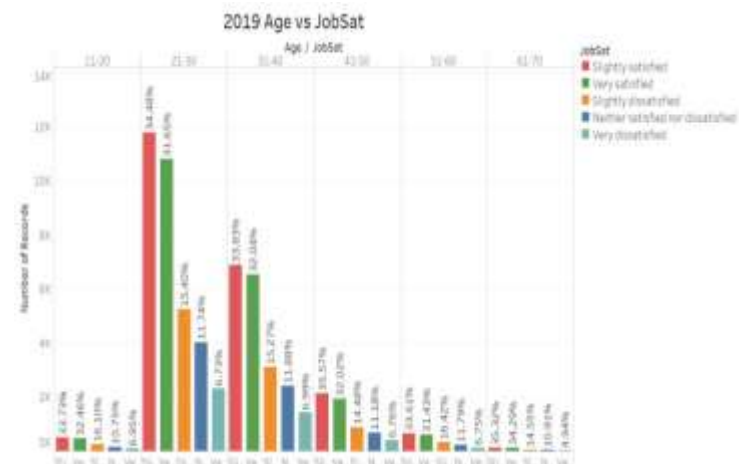

Figure 9: Salary vs Job satisfaction

On the other hand, Figure 9 shows that even though the overall satisfaction level increases with the increase in salary the number of dissatisfied developers remains almost same. Therefore, salary might be the important factor in determining salary of a person, but it is not the only factor influencing the overall job satisfaction. There are some other factors like work culture, work load and other features that equally play important role and will be discussed later in the paper.

RQ2: "Impact of Age on Job Satisfaction criteria?"

The main aim of this question was to find if developers belonging to different age group had same kind of job satisfaction level or it did vary for different age groups.

Figure 10: Age vs Job satisfaction

Figure 10 shows that most of the developers who took the survey belonged to 21-30 or 31-40 years of age. Majority of the developers were satisfied from the kind of work they were doing and same trend was followed by developers of all ages. Therefore, most active developers belong to age group belong to 21-30 and 31-40 years of age.

RQ3: *"Which Developers are more satisfied with their work?"*

Paper focuses on targeting specific developer job profile in parallel to revealing job satisfaction factors. Various job profile was listed in the survey answers. However, we are highlighting full-stack, back-end and front-end developers in this study. Figure 11 displays the developer type count in survey 2019. Majority of respondents registered themselves as full-stack developers that comprises of 57.24% of total count. Back-end developers includes 17.57% and frond-end developers with 5.73%. Apart from the above-mentioned job profiles, we clustered the exclusions and titled as 'Other' job role. This includes data scientists, manager, marketing roles etc.
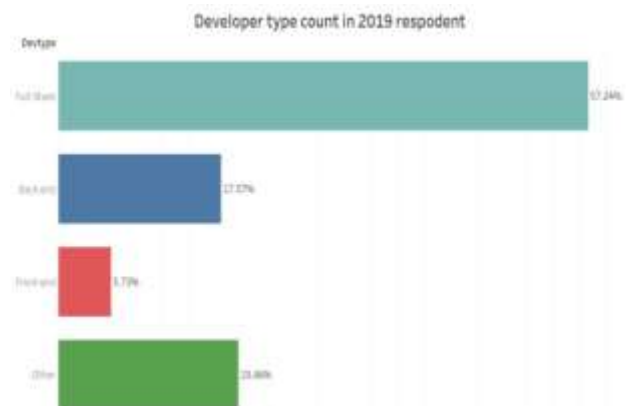

Figure 11: Age, developer type vs Job satisfaction

Most developers participated in the survey and shared the type of work they do. We classified the developers mainly as Full-stack developers, Front-end developers, Back-end developers and others. Other developers consist of students, professors, researchers, data analyst, data scientists and many more. We kept our research specific to the Full-stack developers, Back-end developers, Front-end developers only. This question will try to answer if there is any set of developers that are more satisfied as compared to other developers. There may be many reasons but recognizing this kind of trend would be interesting to know.
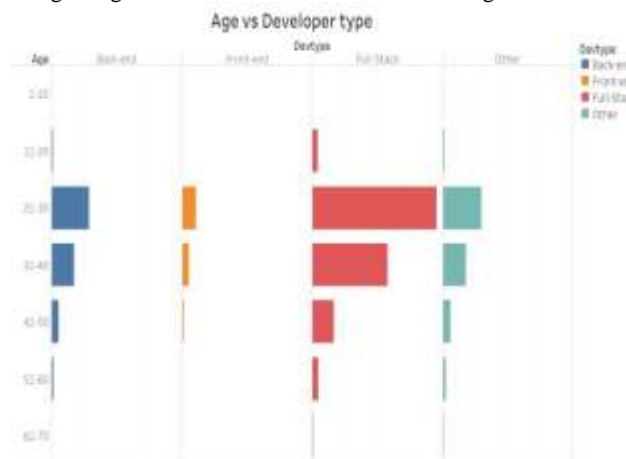

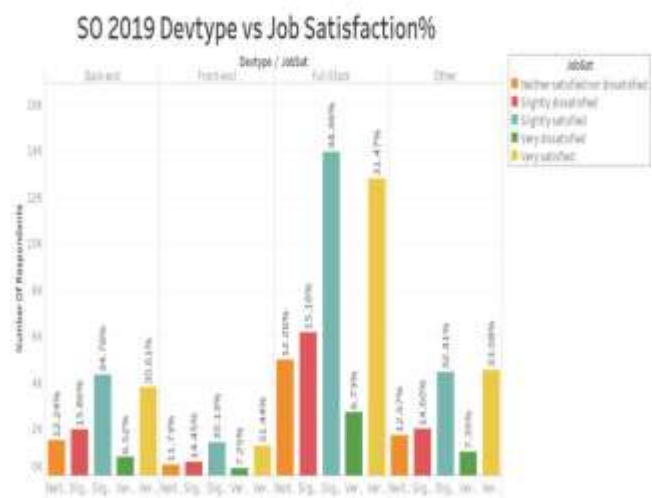**Figure 12: Developer type vs Job Satisfaction**

Figure 13: Developer type vs Job Satisfaction

The statistics above shows that market has a greater number of full-stack developers. The satisfaction level amongst different developers remains almost same with most the coders slightly satisfied from their jobs and very satisfied next to it.
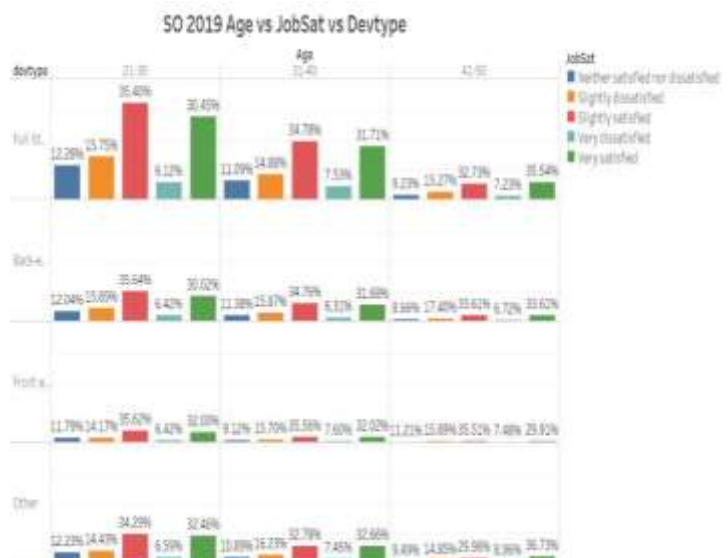

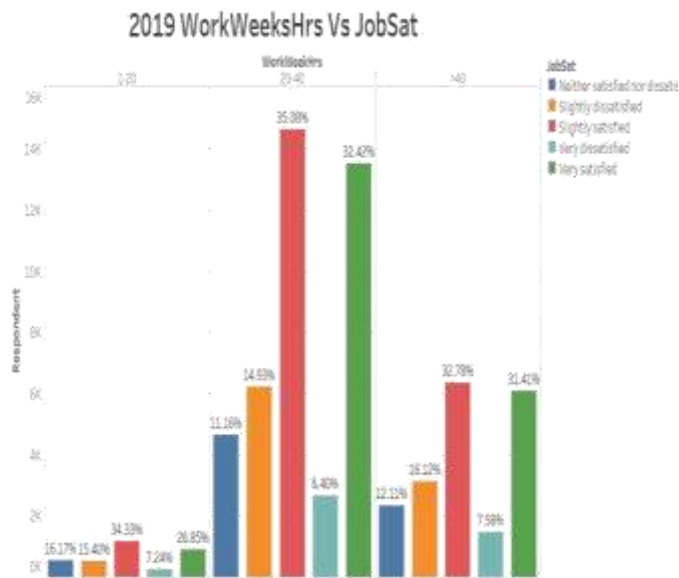**Figure 14: Age, developer type vs Job satisfaction**

We went a step further and computed the age of developers. As known from the previous finding the most active developers found in the age group 21-30 and 31-40 years of age.

RQ4: *"What does Working week hours has to do with Job Satisfaction?"*

Recently Microsoft Japan conducted an experiment where they introduced a program called the "Work Life Choice Challenge," in which company shut down its office every Friday during the month of august and gave all employees an extra day off each week.

The results were promising: While the amount of time spent at work was cut dramatically, productivity — measured by sales per employee — went up by almost 40% compared to the same period the previous year [7] Therefore, number of working hours plays a crucial role in defining the overall satisfaction level of an employee.

**Figure 15: Working hours per week vs Job Satisfaction**

The number of developers working lie mostly in the category of 20-40 hours a week. The number of satisfied developers is around 70% and when we see developers working for more than 40% the number of developers decrease by 10%. We analyzed the pattern with respect to age groups and majority of the developers were satisfied from their jobs as seen in Figure 16. Amongst each group more than 65% of people worked for 20-40 hours a week.
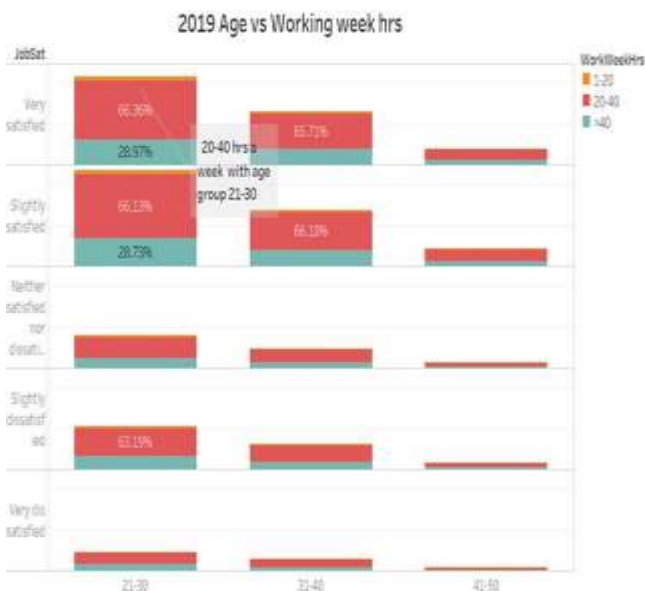
Figure 16: Age and working hours

RQ5: "Is Professional coding Experience related to Job Satisfaction?"

The software industry is governed by different type of developers. This study has been very closely related to understand the type of developers that the software companies have and for how long they have been working in the corporate sector.
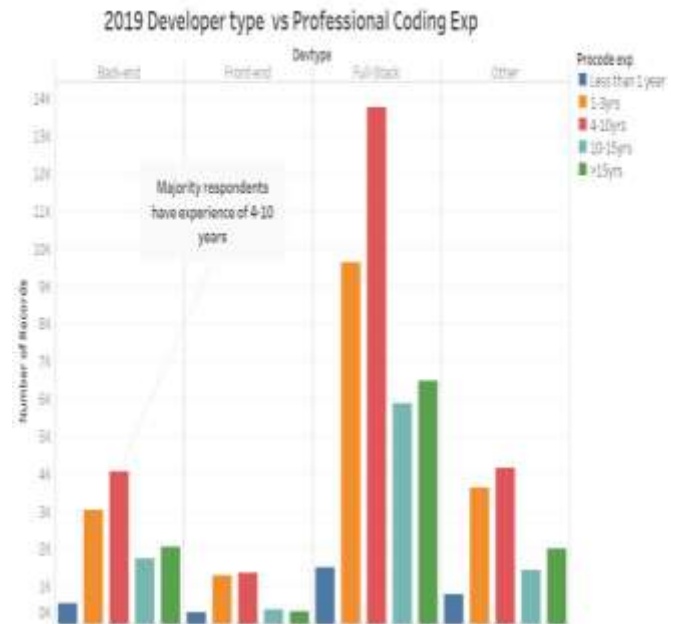
Figure 17: Developer type & years of professional code experience

Figure 17 shows that the industry is governed by the Full-stack developers followed by the Back-end developers. Most of the developers do have a coding experience between 4-10 years and 1-3 years. It would be very appealing to know how years of professional coding experience effect the satisfaction level of a developer. Figure 18 aims to find the correlation between years of coding and overall satisfaction at the job.

Figure 18: Coding Experience vs Job satisfaction for different developer

It is clearly visible that with the increase in number of years of practice the satisfaction level tends to increase. The number of Full-stack developers outnumber other developers. The percentage of developers in the "very satisfied" category increases as the experience level of developers tend to rise.

4. Limitations

The Stack overflow survey 2019 is an effort to study the trends in the IT sector and insights of the same world. However, the survey doesn't completely reflect the figures when compared with the US bureau of labor statistics. There are various other samples that doesn't match the underlying survey and are not just limited to the US. The survey recorded the results from the developers who participated in the survey. Many of the senior developers may not have taken the survey as we see active participation from the people with the age group of 21-40 years. The survey was limited to the stack overflow community only. Majority of the coders use stack overflow for the reference only and were not the participants. [6]

The survey could have been more specific while collecting the user data for example when considering the coding experience the range could have been more refined. 4-10 years of coding experience could have been a person with 10 years of experience at a managerial post but still under same bracket. Also, there is no measure to verify if the data filled in the survey is legitimate.

Some open-ended questions like training sessions for skill development and how it is managed to counter the pressure could have been included to give a clearer picture of the practices being followed at work.

5. Future Scope

The analysis in the paper is based on top rated developer profile. The idea proposed is closely related to developer and work lifestyle. Extension to this work can be considering a specific profile e.g. Data Scientist and further analysis could be made revealing some highlights and insights. Moreover, a classification model can be constructed with class label as Job Satisfaction and training data can be the survey results of all years. This prediction could help in future recruitment or can be used as to determine organizations work culture. Dataset used for the study contains more than 80 features. This paper focuses on evaluation path of determining job satisfaction factors. There can be different evaluation paths using the same dataset. Survey results contains answers about the stack overflow community such as login frequency, posting questions. This can be used as analyzing user behavior with respect to stack overflow usage.

6. Conclusion

The yearly survey from Stack Overflow is an effort to recognize the trending technologies and job profiles that were in demand in the same year. This analysis was taken a step further where we tried to compute how different factors affect the overall satisfaction level at the job and kept it specific to three types of developers broadly – Full-stack developers, Front-end developers and Back-end developers.

The various research question led us to some important conclusions. Salary no doubt is one of the key principles to measure the quality of job, but the analysis shows that though the satisfaction level increase with the hikes in salaries, the number of dissatisfied developers do not decline. There are other aspects that equally play important role in determining the satisfaction level. Age on the other hand didn't show any significant trend with the job satisfaction. All the age groups employees tend to share same kind of experience with majority of the developers being slightly satisfied from the type of work they do. But the survey does show that the most active developers are in the age bracket of 21-30 and 31-40 comprising around 70% of the total developers that took part in the survey. There might be a possibility that senior developers engaged in managerial tasks. Also, even though all the developers share similar movement, analysis show that the Full-stack developers hold the major share in the market. The thought that a kind of developers are more satisfied than the other doesn't hold any ground. All types of developers share same experiences, work-load pressure and many more factors that directly affect the work environment. Most of the developers works for 20-40 hours a week. Most of the developers are satisfied with their jobs. The number of developers working for more hours might be getting overtime and other incentive that might be given in order to attract the employees. The working experience reflects the direct relationship with the job satisfaction. As the developers gain experience, the developers find their jobs more substantial. They learn to manage load, learn to apply necessary skills, efficiency to deal with the regulars. All these things add up and make the life of an employee easier and gradually gives rise to the job satisfaction level.

7. REFERENCES

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