Ahsanullah University of Science & Technology

Department of Computer Science & Engineering

Coding Cat

CSE 3224

Information System Design

&

Software Engineering Lab

Submitted By:

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Coding Cat

Introduction:

An online judge is an online system to test programs in programming contests. They are also used to practice for such contests. Our project, Coding Cat, is an online judge, where the users will be able to build up their coding skills, using programming language they are comforted to, by solving problems that are best suited for them.

Requirements Specification:

Introduction: We have conducted a survey on different groups of people and the purpose of our requirement specification document is to very clearly specify all the functional and non-functional requirements, incorporating the suggestions we have received, based on the performed analysis.

Types of stakeholders of the proposed system: The complete categorization of our proposed system is:

1. Registered user: Problem Solver
2. Unregistered Users
3. Employee of Coding Cat: Problem Setter
4. Companies

Functionality grouping according to the users: The functionality grouping of our proposed system, according to the types of stakeholders, is as follows:

1. **Registered Users:** They are the users, who will register in our system as problem solvers. They will solve the problems from the problems that are set in our website. Mainly students and people keen to learn coding are these types of users.

2. **Unregistered Users:** They will be able to visit our website and see the programming problems, but will not be able to solve them using our platform.

3. **Employee of Coding Cat:**

   Problem Setter: They will set problems and create assessment tests for our website for users to solve.

4. **Companies:** These are the companies with whom we will make contracts so that they can find and hire quality assured talents.

Functional Requirements:

FR01: Add New Users

FR01- 1	System shall enable new users to register as problem solvers
FR01 -2	System shall enable the registered users to login using their username/email-id and password

FR02: View Problems

FR02 - 1	System shall enable both the registered and non-registered users to view the programming problems of our website

FR03: Solve Problems

FR03 - 1	System shall enable the registered users to solve problems according to their choice
FR03 - 2	System shall offer the registered users a choice of programming languages to choose from while solving a problem

FR04: Provide Verdicts

FR04 - 1	System shall be able to provide verdicts of every submitted problem
FR04 - 2	In the event of submission of incorrect codes, which will lead to incorrect answers, the system shall be able to show detailed verdict of the error, such as "Compilation Error", "Time Limit Exceeded", "Wrong Answer" and "Presentation error"

FR05: Providing and record Scores

FR05 - 1	System shall be able to provide scores for each correct solve
FR05 - 2	System shall be able to record all scores of every registered user under their individual account

FR06: Record Verdicts:

FR06 - 1	For each attempted problem, the system shall be able to record all the verdicts under the account of the person who attempted to solve the specific problem

FR07: Setting Problems/Assessments

FR07 - 1	For each category, the system shall be able to add and delete problems to the database.
FR07 - 2	The system shall provide Assessment Tests for the registered users who only pays for it.
FR07 - 3	The system shall generate certificates and badges for the Assessment test passers.

FR08: Live Interviews

FR08 - 1	The system shall provide a Split Screen Interview service to generate an environment for recruiters and recruits.

Non-functional Requirements:

NFR01: Performance

NFR01 - 1	Average load time of the starting page must be less than two seconds

NFR02: Security

NFR02 - 1	The system shall maintain security at all levels
NFR02 - 2	The system must not allow ANY user EXCEPT for the admins to bring any change in the database

NFR03: Reliability

NFR03 - 1	The system has to be online 24 hours a day, 7 days a week, so that the users can solve problems at their convenient times.
NFR03 - 2	In case of a failure that leads to a system outrage, the MTTR (Mean Time to Repair) should not be more than 2 hours.

NFR04: Usability

NFR04 - 1	The user interface of the system should be very user friendly.
NFR04 - 2	It should not take more than 120 seconds for a new user to register for an account.

NFR05: Legal Constraints

NFR05 - 1	All the programming problems on the site must be unique and there should be no copyright violations.

NFR06: Portability

NFR06 - 1	The system should be portable to web browsers.

NFR07: Manageability

NFR07 - 1	The system should be developed in such a way that it can be easily reused, deployed and tested by other developers. Proper documentation must be made during the development phase

NFR08: Defects and Managements

NFR08 - 1	Post release defects must stay within 1 bug per month and must not exceed this threshold
NFR08 - 2	Post release bug fixing should be completed within 5 hours and not any longer.

Overall Constraints: The system has data intensive works, such as managing the programming problems, the registered users and their overall scores, which will help recruiters to select suitable candidates for them. So, maintenance of the database must be done quite frequently, with intensive care and supervision. Although fake accounts are not primarily a problem in this system, as there is no way to harass or bully other registered users, but these fake accounts will affect the database by making it heavier day by day. So, the admins must verify each account to get rid of the fake accounts. Accounts with no activity for a long period of time must be closed automatically, to keep the database as lightweight as possible.

Interview and Questionnaire:

Sampling Decisions: We have undertaken target-oriented method for sampling. Our target research included Facebook, Direct Email, messages, colleges, universities.

Sample Design:

1. **Sample Size:** The sample size selected for the research is 78.
2. **Parameters of Interests:** The major parameter of interest is the subgroup of people who are interested in coding.
3. **Sampling Technique:** Clustered Sampling (Clusters are people with a CSE background from different universities and different jobs, such as students, faculty members and developers)

Data Collection Tools used: The data collection tool used for the research is "Questionnaires" to get the primary data for the empirical research on people's preference on coding. We used web based questionnaire (Google Forms).

The Questionnaire which is attached in the next page consists of several questions printed in a definite order on a form which the respondents read.

<u>Questionnaire on Coding Cat</u>

(Assalamu Alaikum. We would like to create an Online Judge named 'Coding Cat', where you can solve programming problems, arrange programming competitions and develop your overall competitive programming skills. We are also planning on integrating a system where different companies can recruit you. You can help us by replying following questions. We will keep your privacy confidential and won't share the answers. If you find any questions inconvenient, you can skip that one. But you must reply require questions. Have a happy day)

(Personal Information)

1. Your Name _____

(Demographic Question)

2. Gender:
- ❏ Male
- ❏ Female

3. Age Group:
- ❏ Below 20
- ❏ 20-29
- ❏ 30-39
- ❏ 40 and above

4. Occupation:
- ❏ Student
- ❏ Govt. Employee
- ❏ Employer
- ❏ Businessman
- ❏ Engineer
- ❏ Other:_____

(Project Related Questions)

5. How long you have been using internet?
- ❏ Never
- ❏ Less than 1 year
- ❏ 1-3 years
- ❏ 3-5 years
- ❏ More than 5 years

6. For what activities you use internet?

- ❏ Social Networking
- ❏ Information Gathering
- ❏ Entertainment
- ❏ Finance
- ❏ Shopping
- ❏ Coding
- ❏ Other:_____

7. Do you like coding?

- ❏ Yes
- ❏ No
- ❏ Maybe

8. Do you know about Online Judge?

- ❏ Yes
- ❏ No
- ❏ Maybe

9. If Yes or Maybe, have you participated in any online programming contest or upsolved any problem in any online judge?

- ❏ Yes
- ❏ No
- ❏ Maybe

10. Which Online Judges you prefer

- ❏ UVA
- ❏ Code Forces
- ❏ Codechef
- ❏ Hacker Rank
- ❏ HackerEarth
- ❏ URI
- ❏ Other:_____

11. Are You a Project Manager?

- ❏ Yes
- ❏ No

(If You Select 'Yes' then you will be taken to 'Project Manager's Section', otherwise you will be taken to 'Talent's Section')

(Project Manager's Section)

1. As a project manager, what kind of people do you want to hire

- ❏ Software Engineer
- ❏ Software Developer
- ❏ Backend Engineer
- ❏ Frontend Engineer
- ❏ Web Developer
- ❏ Mobile App Developer
- ❏ Game Developer
- ❏ Tester
- ❏ Other:_____

2. If you were to recruit candidates from online judges, what would affect your satisfaction the most?

	Very Important	Important	Not Important
User Friendly			
User Interface			
Smart Search			
Score			
Rating			

3. As a project manager, which of the following would you want from an Online Judge while hiring

- ❏ Hiring Proper Talents
- ❏ Quality Technical Assessments
- ❏ Curriculum Vitae(CV) of Candidate
- ❏ Live Technical Interview
- ❏ Other:_____

4. If you're hiring a talent right now, what kind of expertise are you looking for?

_____

5. How much experience you look before you hire someone?

0	1	2	3	4	5

(Talent's Section)

1. Languages you prefer for coding

- ❏ C
- ❏ Java
- ❏ Python
- ❏ C++
- ❏ C#
- ❏ Other:_____

2. How much confident are you in your coding?

	1	2	3	4	5	
Hesitant						Expert

3. Have you ever been hired online by IT companies?

- ❏ Yes
- ❏ No
- ❏ Maybe

4. If you were hired by an IT company, what would be your expected salary?

- ❏ Below 20,000
- ❏ 20,000-25,000
- ❏ 25,000-35,000
- ❏ 35,000-45,000
- ❏ 45,000-60,000
- ❏ 60,000 or above

5. While doing programming contest or solving problems in Online Judge what affects your satisfaction the most?

	Very Important	Important	Not Important
User Interface and Experience			
Practice Problem Categories			
Language Sufficiency			
Leaderboards and Ratings			
Private Contests			
Technical Assessment Test			

6. As a contestant, you want from an Online Judge

- ❏ Beautiful UI
- ❏ Technical Assessment Test
- ❏ Job Opportunities
- ❏ Curriculum Vitae (CV) submission system
- ❏ Other:_____

(Final Section)

1. Do you think an Online Judge should have higher concepts like Machine Learning, Deep Learning?

- ❏ Yes
- ❏ No
- ❏ Maybe

2. Your thoughts on a platform where you can get hired based on your skills on an online judge platform

_____

3. Any special suggestions for our website

_____

Data Analysis:

Gender:

Gender		
Male	**Female**	**Total**
48	30	78
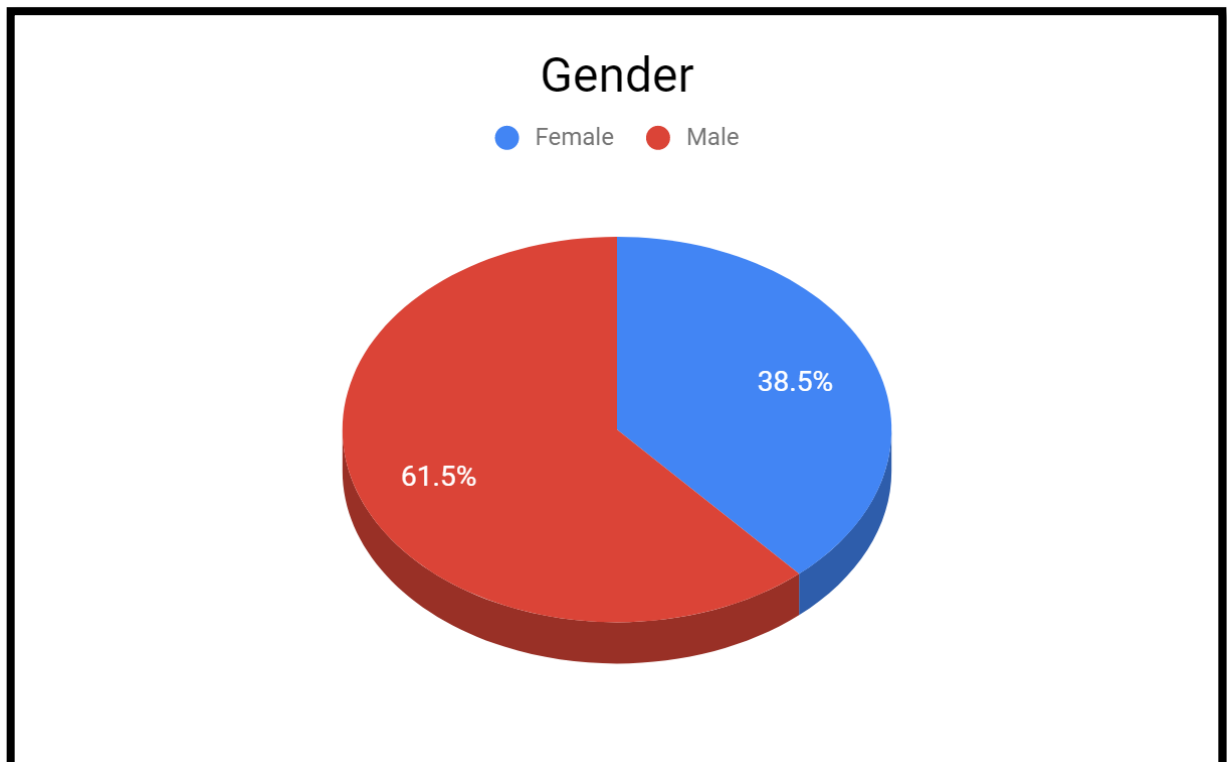
Illustration:

- The above diagram depicts that out of the total 77 respondent 61.5% of the respondents were male and the rest were female respondent.

Age Group:

Age Group			
Below 20	**20-29**	**30-39**	**Total**
1	76	1	78
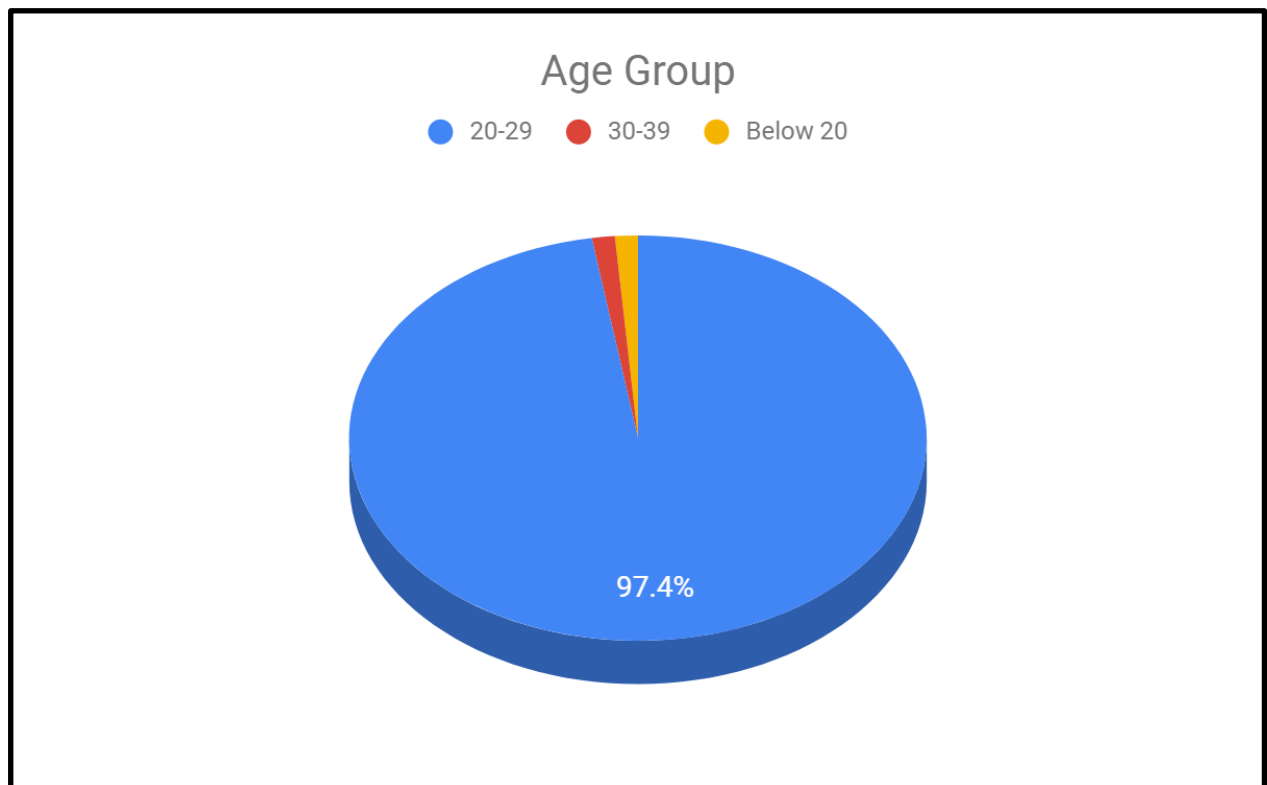
Illustration:

- 97.4 % of the respondent were among 20-29 bracket as these respondents are well educated.
- 1.3% of the respondents were Below 20 and 1.3% of the respondents were among 30-39 bracket

Occupation:

Occupation				
Student	**Engineer**	**Teacher**	**Unemployed**	**Total**
67	9	1	1	78
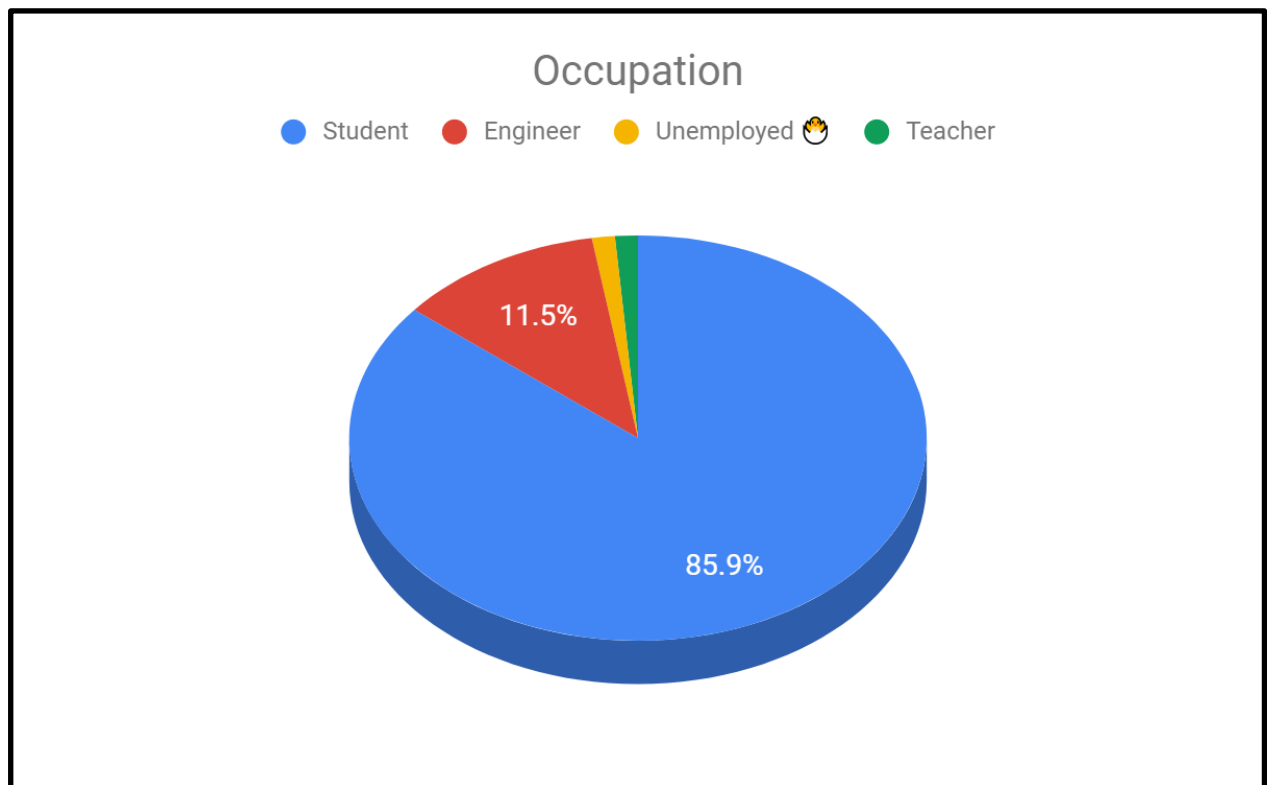
<u>Illustration:</u>

- For the research to be successful most of the respondents are students who really needs this website

Do You Like Coding?

Yes	No	Maybe	Total
52	9	17	78
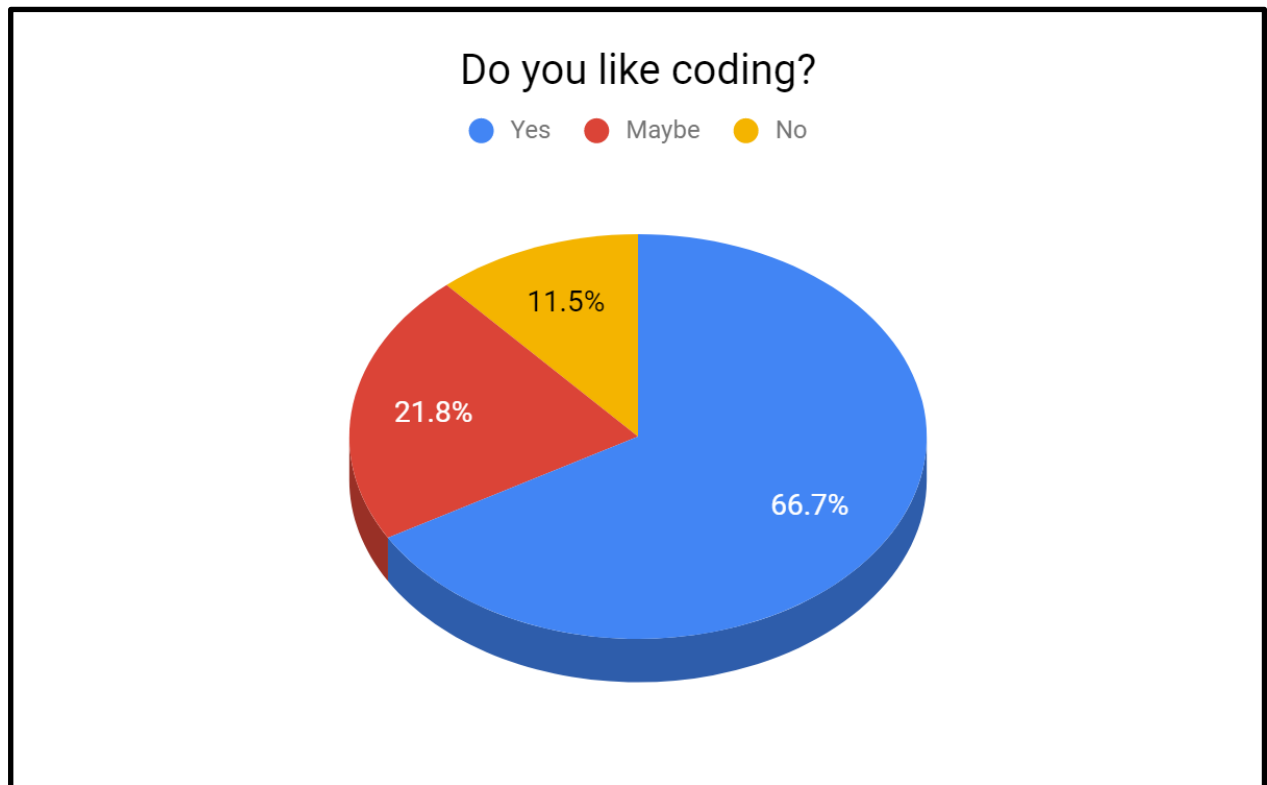
Illustration:

- On this research we can see 66.7% respondents like to do coding.
- Among rest respondents 21.8% respondents are interested but not like the 66.7%. And rest 11.5% do not like coding

Do you know about Online Judge?

Yes	No	Maybe	Total
74	3	1	78
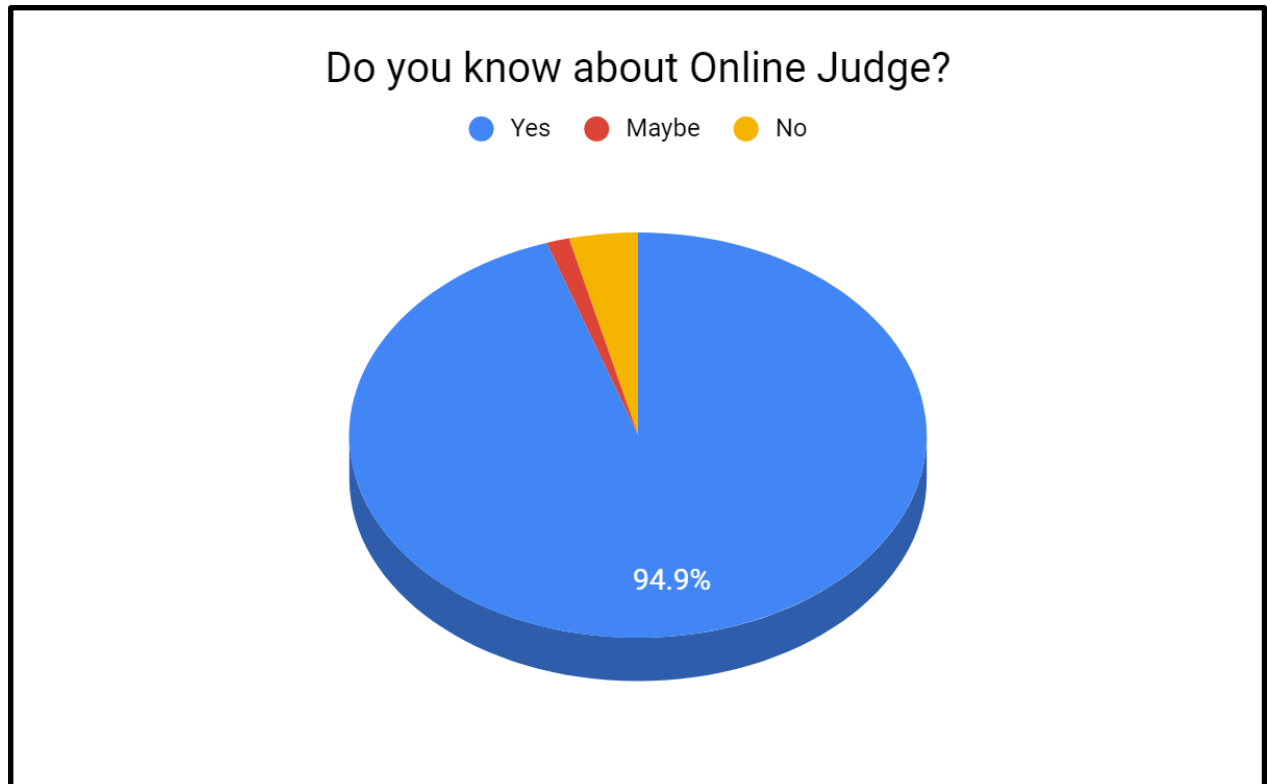
Illustration:

- On this research we can see 94.9% respondents know about Online Judge.
- Among rest respondents 3.8% respondents do not know about Online Judge and 1.3% may have some idea about Online Judge

Online Judges Preference:

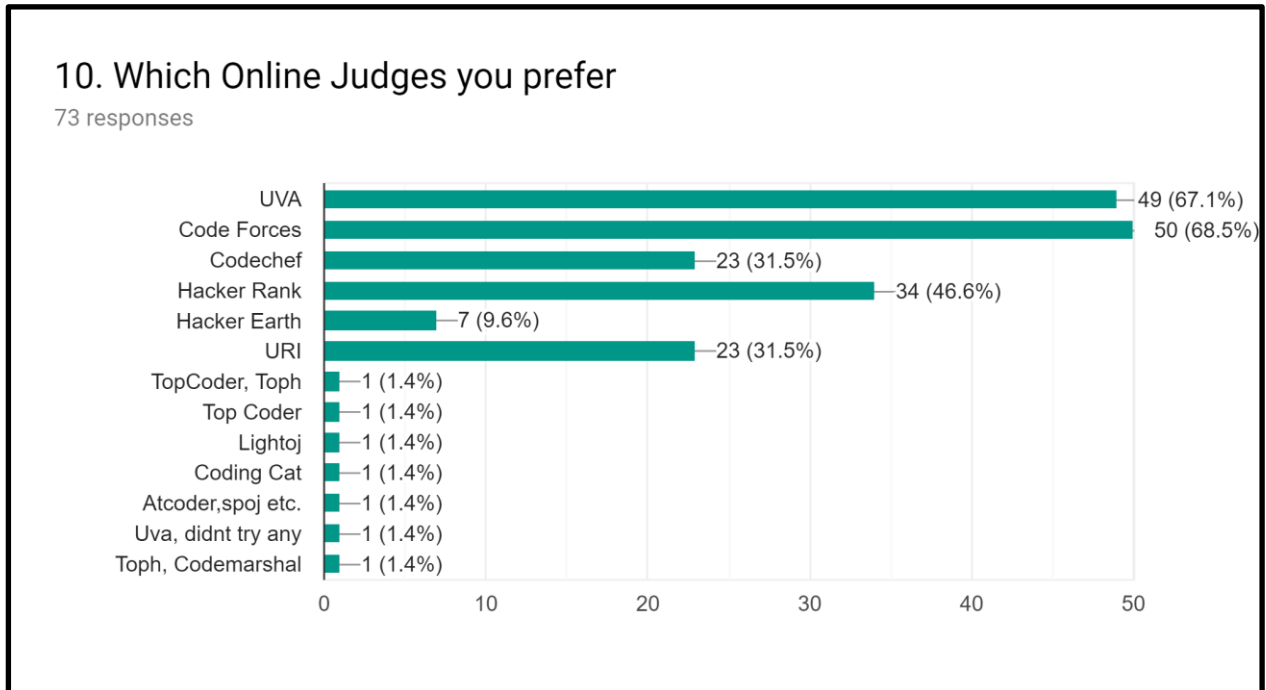| UVA	Code Forces	Code Chef	Hacker Rank	Hacker Earth	URI	Other
49	50	23	34	7	23	7

10. Which Online Judges you prefer
73 responses

Illustration:

- From the above response we can see that Code Forces is the most preferred Online Judge.
- UVA is preferred after Code Forces.

Are You a Project Manager?

Yes	No	Total
11	67	78

Illustration:

- From the above response we found that 85.9% respondents are willing to provide services, rest are Project Managers.

Languages Preference:

C	Java	Python	C++	C#	JavaScript
39	30	18	50	5	1

1. Languages you prefer for coding
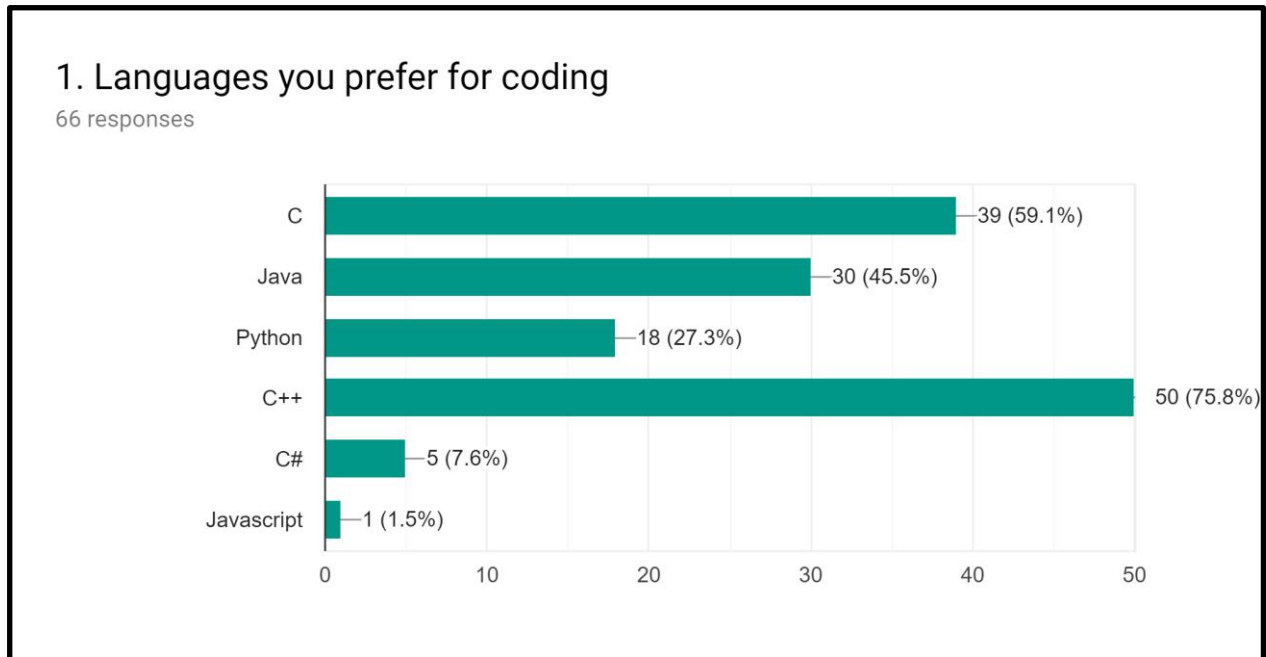
66 responses

Illustration:

- From the above response we found that talents prefer C/C++ more than any languages for solving problems.

How confident are you in your coding?

1	2	3	4	5
6	11	34	13	3

2. How much confident are you in your coding?

67 responses
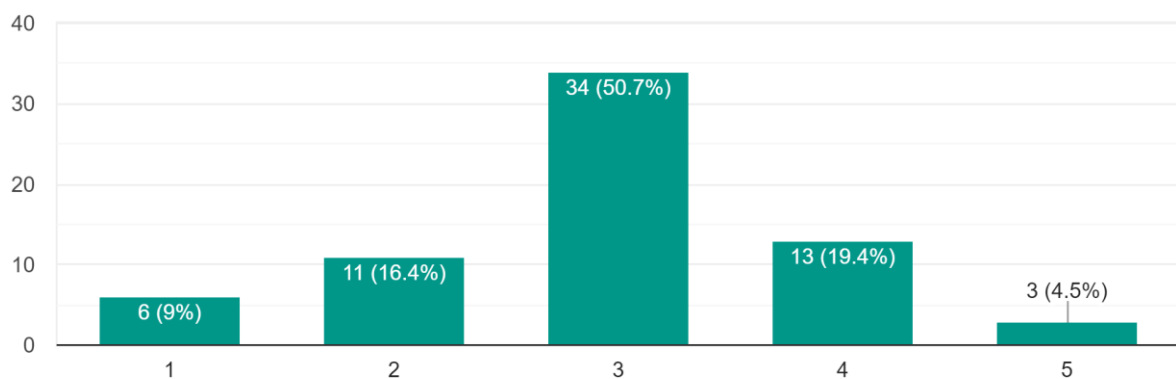
Illustration:

- From the above response we found that most talents rate their confidence level in coding 3 out of 5.
- Only 4.5% rate their confidence level in coding 5 out of 5.

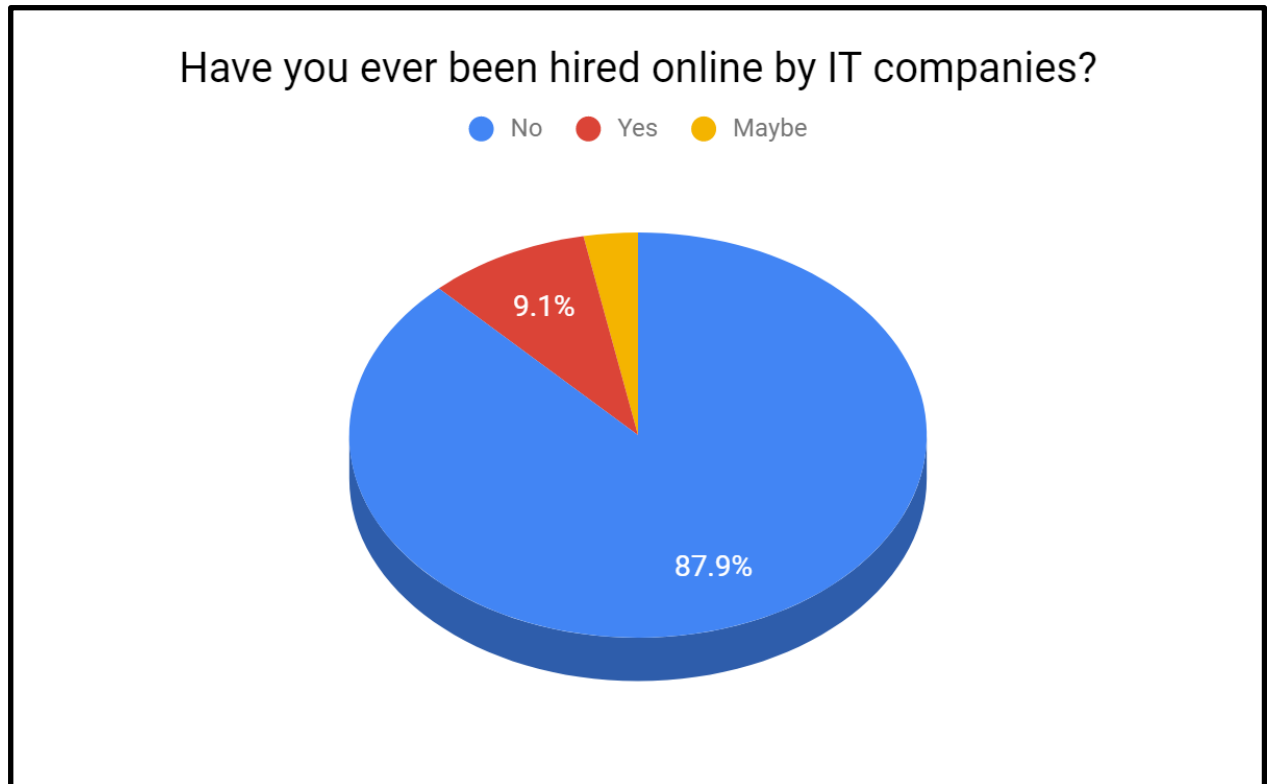**Have you ever been hired online by IT Companies:**

Yes	No	Maybe
6	58	2

Illustration:

- From the above response we found that 87.9% was not hired online by IT companies but 9.1% was hired. So the online hiring system will really impact the website as a robust feature.

If you were hired by an IT company, what would be your expected salary?

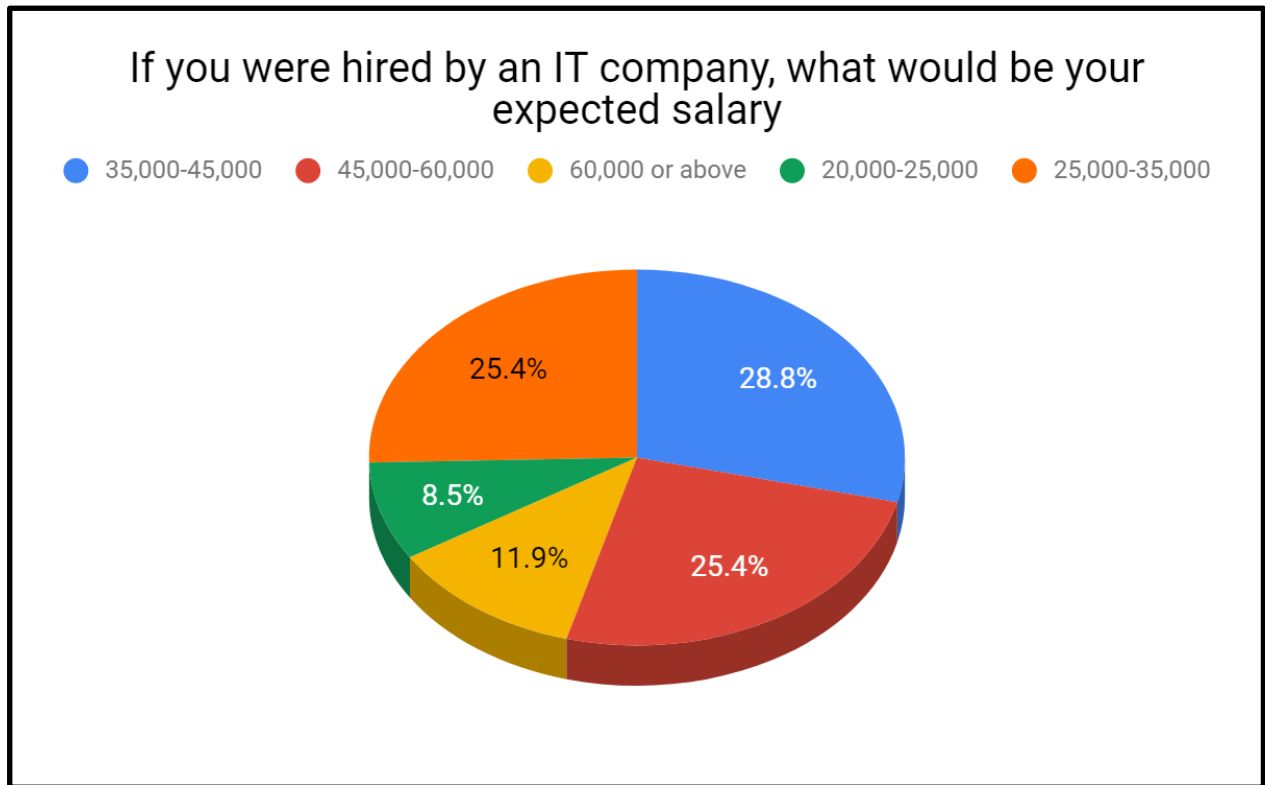| Below 20,000	20000-25000	25000-35000	35000-45000	45000-60000	60000 or above
0	5	15	17	15	7

Illustration:

- From the above response we found that talents are mostly satisfied when their salary is between 35,000- 45,000 with 28.8 percentage.
- No talents want to be hired for Below 20,000 salary per month.

While doing programming contest or solving problems in Online Judge what affects your satisfaction the most?

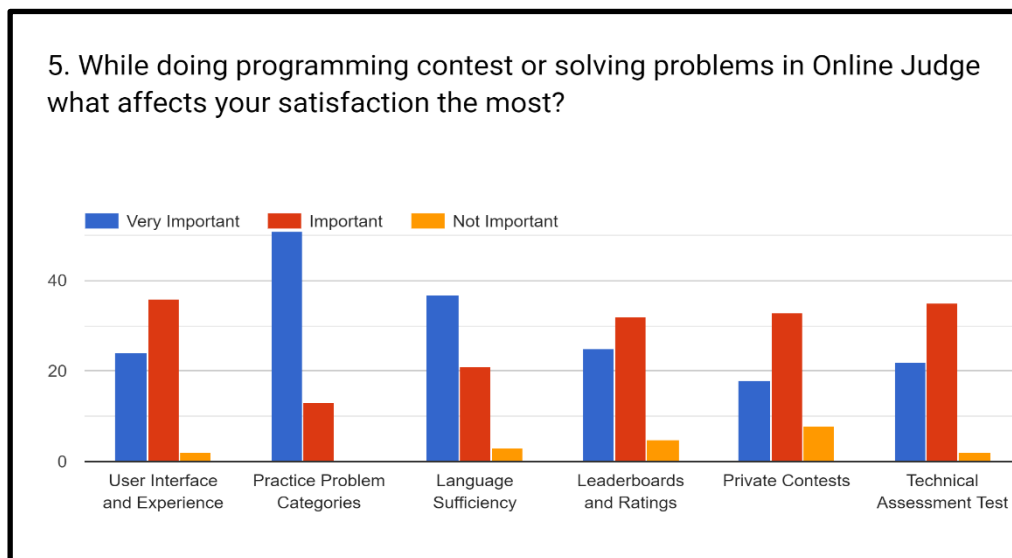|	Very Important	Important	Not Important
User Interface and Experience	24	36	2
Practice Problem Categories	51	13	0
Language Sufficiency	37	21	3
Leaderboards and Ratings	25	32	5
Private Contests	18	33	8
Technical Assessment Test	22	35	2

Illustration:

- Online Judge must have Practice Problem Categories. It is a very important point that we found from the survey.
- Language Sufficiency is also very important for an Online Judge.
- User Interface and Experience is Important while doing programming contest or solving problems in Online Judge.
- Leaderboards and Ratings is important but to some also thinks that its importance is negligible.
- Private Contests is also important for an Online Judge but not Very Important.
- Technical Assessment Test seems to be important as well.

As a contestant, you want from an Online Judge

Beautiful UI	Technical Assessment Test	Job Opportunities	CV Submission System	Other
30	48	44	28	5

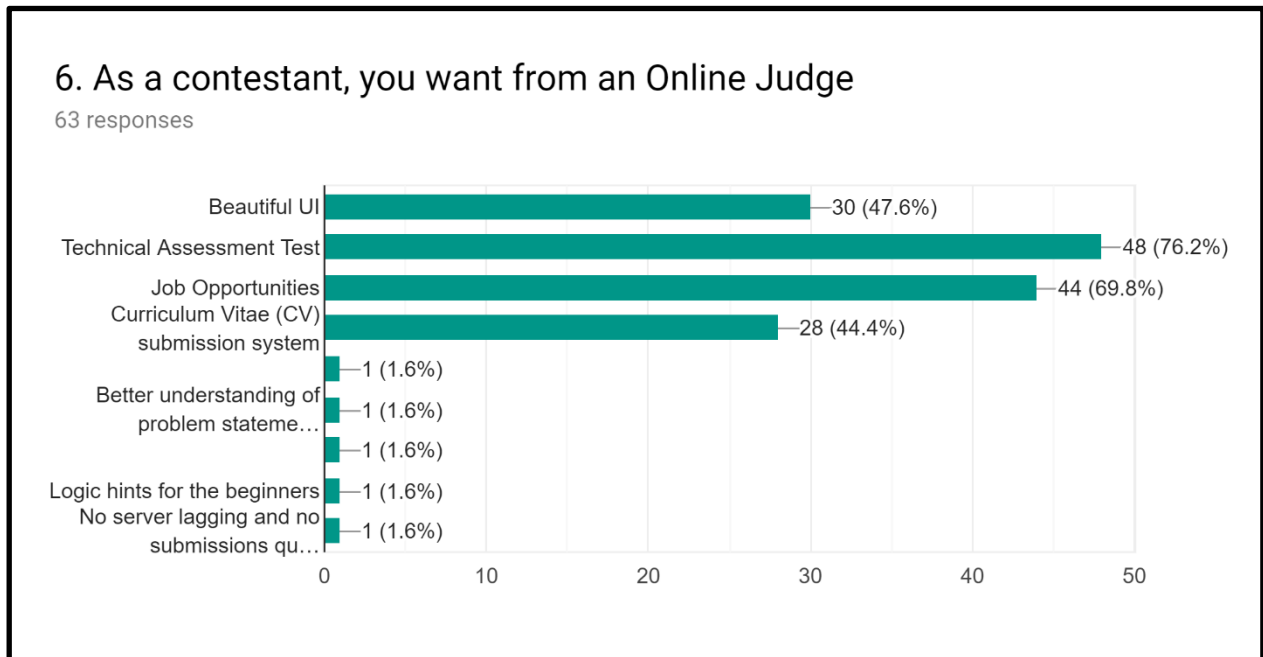## 6. As a contestant, you want from an Online Judge

63 responses

Illustration:

- Among Respondents, most of the contestants wanted Technical Assessment Test with 76.2%.
- Job Opportunities is second most wanted thing in an Online Judge with 69.8%.

Project Manager's Section

As a project manager, what kind of people do you want to hire?

Software Engineer	Software Developer	Backend Engineer	Frontend Engineer	Web Developer	Mobile App Developer	Game Developer	Tester	Other
5	6	6	6	6	3	4	6	2

1. As a project manager, What kind of people do you want to hire
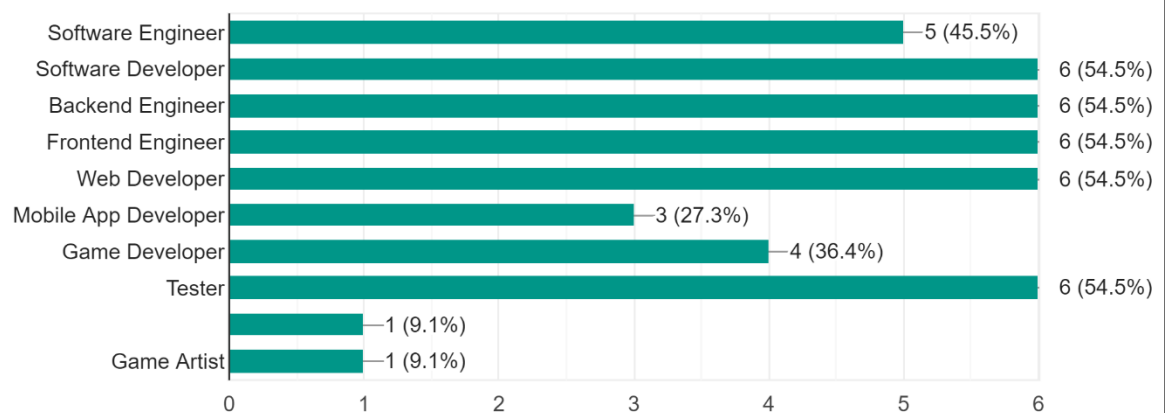11 responses

Illustration:

- From the above chart we can see that most of the Project Manager wants to hire Software Developer, Backend Engineer, Frontend Engineer, Web Developer and Tester.

If you were to recruit candidates from online judges, what would affect your satisfaction the most?

	Very Important	Important	Not Important
User Friendly	7	4	0
User Interface	6	4	1
Smart Search	7	4	0
Score	2	9	0
Rating	6	3	2

2. If you were to recruit candidates from online judges, what would affect your satisfaction the most?
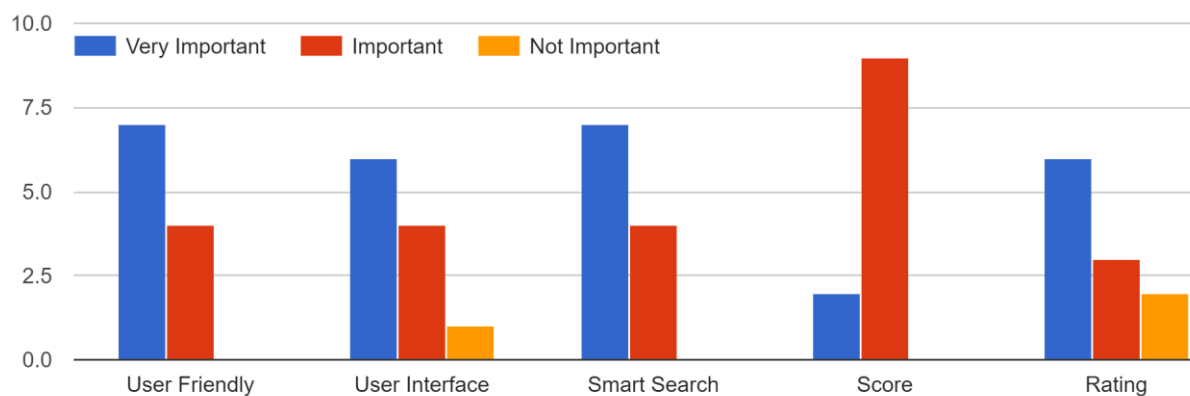
Illustration:

- We can see that Project managers thinks that User Friendly is a very important thing for Online Judge.
- We also can see that User Interface is also a very important thing for an Online Judge.
- Smart Search is also a very important thing for an Online Judge.
- Score is an important thing for an Online Judge, but not so important.
- Rating is also a very important thing for an Online Judge.

As a project manager, which of the following would you want from an Online Judge while hiring

Hiring Proper Talents	Quality Technical Assessments	CV of Candidate	Live Technical Interview	Other
6	5	3	5	1

3. As a project manager, which of the following would you want from an Online Judge while hiring

10 responses

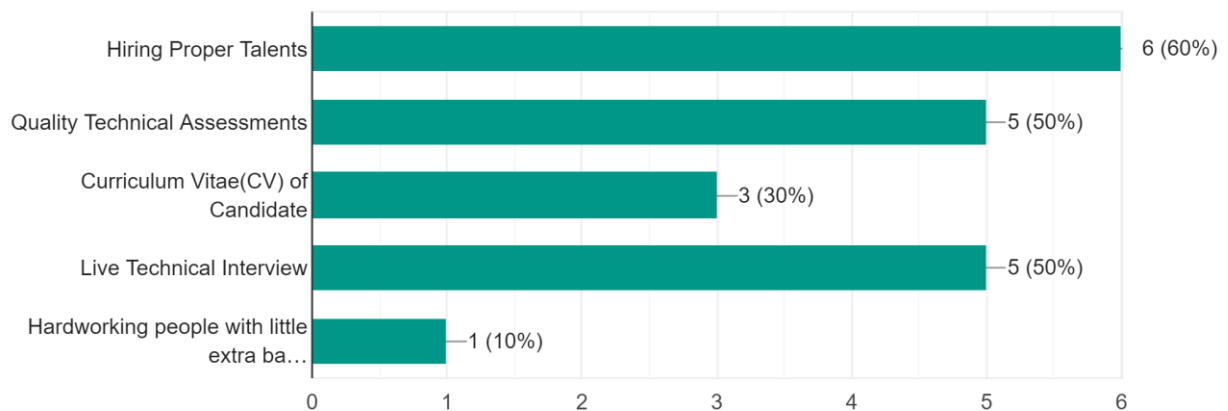|	
Hiring Proper Talents	6 (60%)
Quality Technical Assessments	5 (50%)
Curriculum Vitae(CV) of Candidate	3 (30%)
Live Technical Interview	5 (50%)
Hardworking people with little extra ba…	1 (10%)

Illustration:

- Most of the Project Managers want to hire proper talents from Online Judge while hiring.
- Project Managers also want to have Quality Technical Assessments and Live Technical Interview while hiring a candidate from an Online Judge.

How much experience you look before you hire someone

0	1	2	3	4	5
1	1	1	3	4	1

5. How much experience you look before you hire someone?
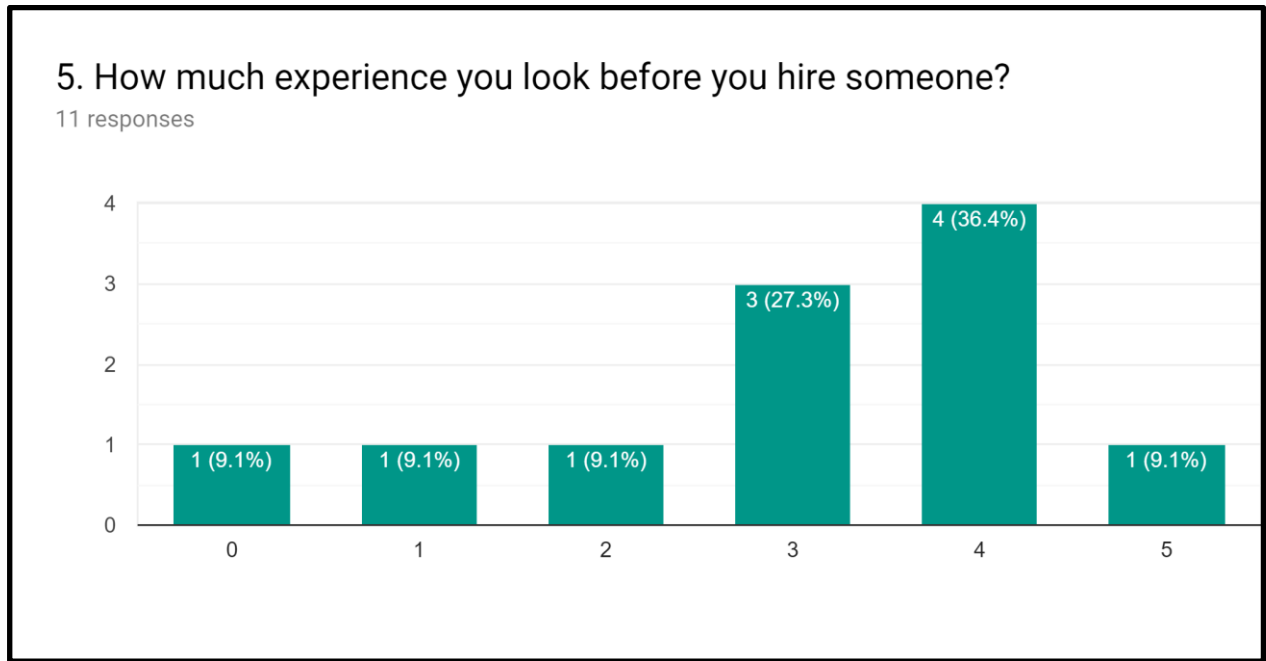
11 responses

Illustration:

- Most Project Managers want to hire candidates who have experience of 4 years.
- 3 years' experience is second choice for Project Managers.

Final Section

Do you think an Online Judge should have higher concepts like Machine Learning, Deep Learning?

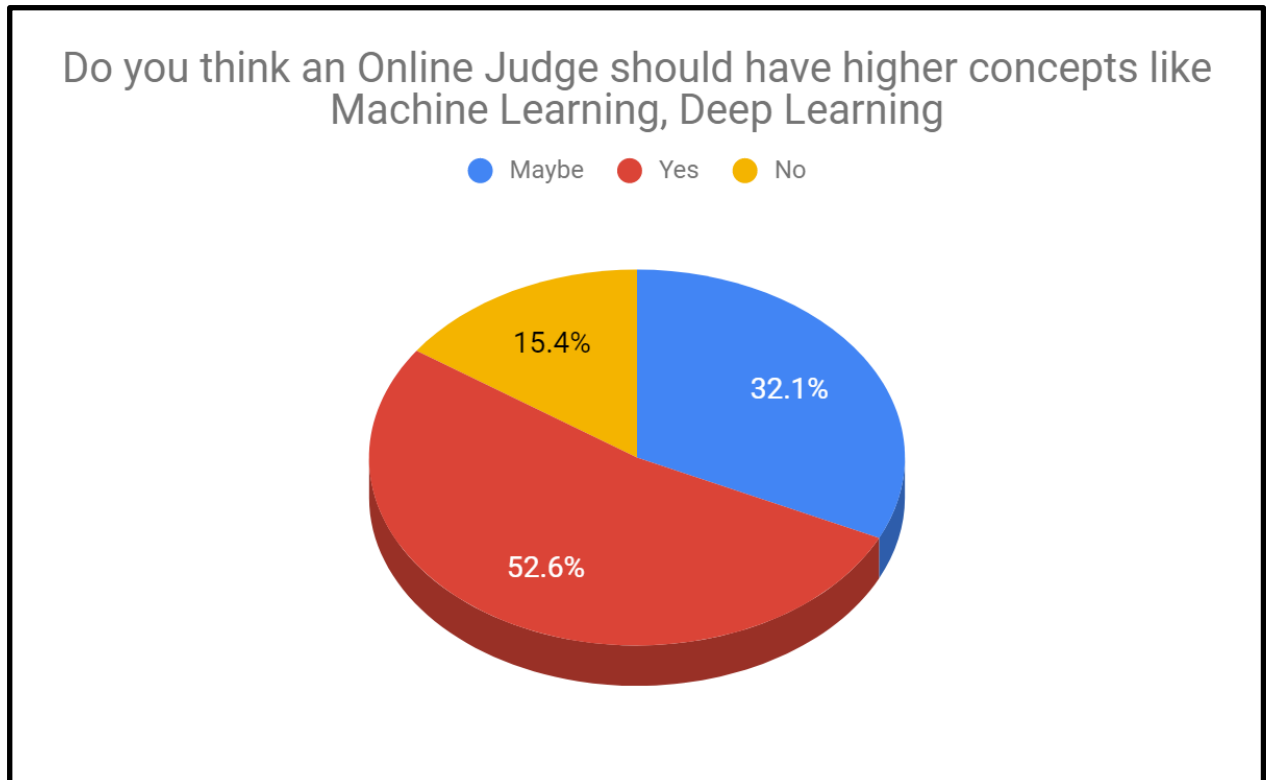| Yes	No	Maybe
41	12	25

Illustration:

- From both Talents and Project Managers, we found that 52.6% respondents think that an Online Judge should have higher concepts like Machine Learning, Deep Learning.

Overall findings of this survey:

1. The most dominant stakeholders of this websites will be students; unemployed; willing to get hired.
2. Young Adult Males in the range of 20 to 29 are more invested in online judges. But the differences are not that far apart.
3. Although almost 95% of participants know about Online Judges, only around 67% of them like to code and practice problems.
4. Most of our participants have moderate confidence in coding skills. A rare portion of them seem to have a lot of confidence.
5. The most popular language preference was C/C++
6. Although 87.9% of our sample have been never hired online, they expect a salary above 20,000BDT on the event of getting hired online.
7. Practice problem categories, Language sufficiency, UI/UX of websites, Technical assessments and private contests all seem to have importance, but Practice Problem Categories is rated the highest of all concerns.
8. Only 14% were project managers of all participants, who are willing to hire Software Developer, Backend Engineer, Frontend Engineer, Web Developer and Tester.
9. Half of the sample support the idea of adding Machine Learning problems in the system.
10. 50% of the project managers want to have a Quality Technical Assessments and Live Interview system.
11. They want the services with beautiful UI/UX and easy Smart Searching based upon candidate's scores and ratings.
12. Also it seems 3-4 years of experience is a more common for a talent to get hired by project managers.

Conclusion:

Based on the findings of the survey, we came to understand that our website will be a success if we follow the following manners:

1. Providing good and quality problems so that more users join our websites.
2. As they are not really confident in coding, their confidence in coding is expected to grow overtime
3. We must provide C/C++ language support in our website, along with other languages.
4. We shall make sure our talents can properly negotiate during hiring section and not getting offer less than 20K BDT.
5. Technical Assessment tests are both important to want to be hired users and company managers who are willing to hire.
6. Technical Assessments shall focus more into Web/Software Development and Front/Back-end Engineering tests.
7. Some emphasis should be given on adding Machine Learning problems, as about half of our sample believe that it will be beneficiary.
8. We must work on a live interview feature for our website as it has the support of the majority portion of our sample.
9. Most importantly, ensuring quality in every feature is recommended.