MOTIVATION TO RESPOND ON STACK OVERFLOW Q&A WEBSITE

Fatemeh Esmaeilzadeh,

MSc, Department of Computer Engineering, Faculty of Engineering, Khatam University, Tehran, Iran

Abstract. The importance of using Q&A sites such as Stack Overflow and Code Project, etc. is obvious to everyone in order to solve the potential problems of the developers. The objective of this research was to increase the participation rate and responsiveness of developers on Stack Overflow website by improving the gamification methods. To present the proposed solution, a tool called Stack Overflow Super Gamification (SSG) was proposed, which is an extension for Eclipse. The purpose of this extension is to create an ongoing competition and motivation among developers to participate in answering questions on Stack Overflow site. In this extension, the ranking practices for active users on the site are improved so that the continuity of participation in the site will earn more privileges. Also, the ranking structure of the users with various nationalities who have gained privileges was used to create a motivation and competition among the developers of different countries. Rewards for users in this extension, for example, offering superior job opportunities based on higher privileges, as well as providing an opportunity to advertise products or businesses and demonstrate personal abilities and talent for free, will make them more willing to participate, and will provide the incentive to stay active on the site. The proposed solutions will not only provide more activities and answers to more questions, but also bring valuable achievements to developers active on the site. According to the evaluations, the performance of the proposed solution for motivating developers to participate and answer the questions on the Stack Overflow site is acceptable. Since the purpose of this strategy is to encourage developers to participate effectively on the site, the evaluation results clearly reflect the usefulness of this solution in motivating developers. The results indicate that while the developers are actively involved, the number of unanswered questions, as well as unacceptable responses is reduced, and in the meanwhile, the quality of the responses given is acceptable in terms of brevity, completeness, and accuracy.

Keywords: Gamification, Motivation on Stack Overflow website, Q&A sites.

Introduction. Stack Overflow is an important reference to bug fixes for developers. In 2011, it has 4.1 million users and 7.1 million daily visits. Due to the increasing expansion of various programming branches, the importance of using this site and its application is increasing day by day, so that researchers are looking for a way to improve the performance of the site and increase its productivity. For example, Ponzanelli et al. have designed an extension for the Eclipse environment to facilitate responsiveness on the Stack Overflow website [7]. Asaduzzaman et al. [1] conducted research on unanswered questions on the Stack Overflow site in order to anticipate such questions. Meanwhile, there are some ways, such as awarding badges and privileges, to create interest for users in order to share their programming knowledge. Despite the existence of these policies, the significant number of unanswered questions on Stack Overflow indicates that there is a defect in the gamification methods implemented on the site. At the same time, awarding badges and privileges cannot continuously motivate users of Stack Overflow. The statistics show that there are approximately 28,976,728 questions on the site that have not received an acceptable response. There is also an average of 1,854,763 questions that basically have not been answered. At the same time, some questions that have been answered do not have the quality to be reused and there may be errors when using them. Therefore, we need a way to encourage qualified developers to participate in answering the questions. The Stack Overflow site uses awarding badge method to do this. However, this method has not been able to continuously motivate users. For example, 7,607,751 of the users who received the badges have not visited the site for more than 6 months, and as a result, did not contribute to answering questions. Meanwhile, the result of psychological studies shows that receiving the badges is valuable to users the first time and is a repetitive experience for next times. This study is aimed to encourage developers to participate in answering questions by providing new motivational methods for them, as well as trying to have an ongoing impact on developers. This way, it seeks to reduce the number of unanswered questions and unacceptable answers.

Below is a list of related research backgrounds:

Hamarie et al. (2004) explored the use of a gaming system in a non-gaming environment and examined the success of gamification and its impact on user motivation [2]. Fard et al. (2016) reviewed the fundamental mechanisms of gamification. Recent research suggests that gamification has the potential to increase intrinsic motivation; however, it cannot always have positive outcomes. The main reason why gamification is sometimes successful and sometimes unsuccessful is still unclear. One reason is that the research has no theoretical basis [3]. Slug et al. (2015) investigated why most users are posting just once. Activity on Q&A sites depends on different aspects of users such as personality, the field of expertise, and how they work. This paper sought to analyze users who are less active. Understanding what makes users work together is one of the goals of the study [4]. Jane et al. (2015) studied the distribution of gamification-driven tendencies in Stack Overflow. In addition, a number of parameters related to the time to answer the question are issued. A four-month analysis was conducted on 101291 members, which showed that the fastest response time was 237 seconds during this interval. Findings showed that 92% of the respondents are quicker than others. Acceptable answers did not have

a clear relationship with the speed of response [5]. In 2014, Rawid and Kurdish proposed an open-source database for sharing different game mechanisms and dynamic structures. Since different people are motivated in various ways, gamification designers need to know what triggers the user, and how different elements of the game or combination of elements will meet this need. Measuring the amount of entertainment is done through gamification analysis. The implementation of the ideal gamification, considering population and personality, should be able to provoke high-level stimuli to the users [6].

Method. To solve the above-mentioned problem, this paper attempted to present new gamification policies for participating in the Stack Overflow website. For this purpose, the new scoring criteria were specified, then the scores were calculated, and a scoreboard was given based on it. Finally, users were encouraged to participate in responsiveness and activity on the site through rewarding practices. Therefore, according to the procedure in of Fig. 1, the solution was designed. The proposed strategy was divided into four phases:

1. All rating policies were explained.
2. User privileges were calculated, and the obtained privileges were ranked at two local and global levels.
3. Reward system applied to the results.
4. Finally, the previous phases are integrated, and a complete tool is presented to solve the problem.

In the following, we will detail each of the phases.
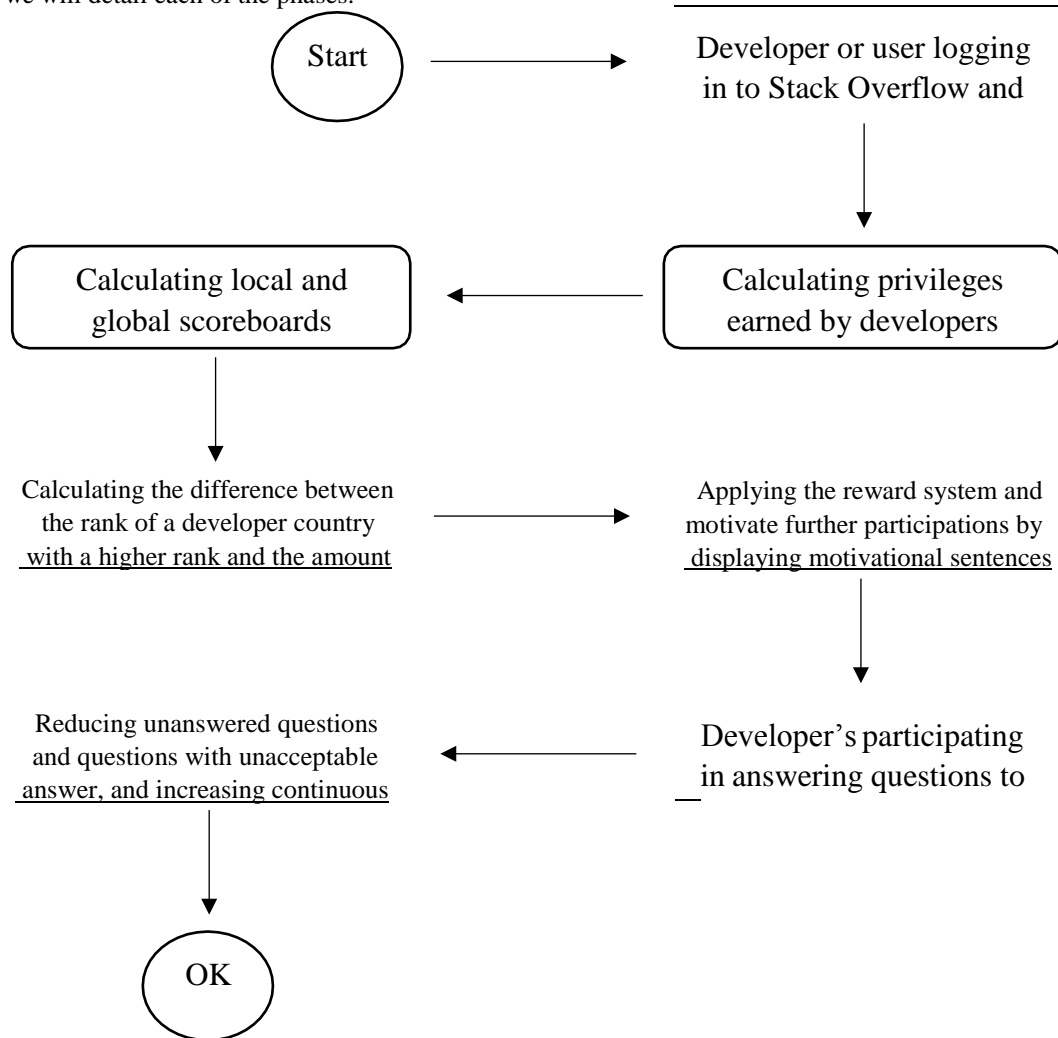

Figure 1 - The overall procedure of the proposed strategy

Generally, the scoring criterion on the Stack Overflow site is the sum of the positive votes (voted up) earned by the person minus the negative votes (voted down) of the same person, which is calculated on a daily basis at 3 am. This research sought to add the scoring mechanisms to boost users' continued participation by motivating and encouraging more them to participate more and respond to questions, as well as to reduce unanswered questions and questions with unacceptable answer. For this purpose, a set of scoring policies is defined as follows:

1. Considering the oldness of question: Examining questions that do not have an acceptable answer indicates that more than 93% of these questions are related to the past months, which either have no answers or an acceptable answer. To reduce this number, considering the question oldness, a weight is considered to score the question.
2. Considering the weight of question: Some of the questions raised on the Stack Overflow website are among the questions that many users have encountered, and the answer to that question is important for more users. In contrast, a number of questions are less targeted by developers and fewer users are expected to face these issues. Therefore, the weight of the question is used to score the answer to questions.
3. Considering continuity in participation: One of the issues on the Stack Overflow website is the users who have long been out of the site despite receiving a badge. In fact, for this group of users, awarding the badges has failed to motivate continued participation. Therefore, in the new scoring policies, a portion of the score is allocated to the continuity of the activity on the site.
4. Considering the weight of the questioner: To evaluate the users who have had the most effective activity on the site and spend a lot of time, the users will receive distinct privileges from top developers[1] and heroes[2] in answering the questions.[3]

In general, in defining the scoring policies, solutions were sought that can reduce the problems on the Stack Overflow site, the number of unanswered questions, and questions with unacceptable questions by motivating users to continuously be active, resulting in a more effective site performance.

3.2. Calculation of the users' privileges

After explaining the scoring policies, the users' privileges were calculated. The results of these privileges are displayed on the scoreboard. In this research, competition between users was considered at two levels: local and global.

Competition at the local level

First, all people in the same country who are active on the Stack Overflow site compete. The result of this competition is displayed in terms of privileges earned by the people in the local scoreboard. In this level, three groups are considered to create competition and motivation for activity:

- Top developers group: The first 10 people ranked top in the local scoreboard are top developers.
- Heroes group: 30 developers who gained the highest privileges but lower than top developers are heroes and can be a part of top developers by being more active on the site and earning privileges.
- Discoverers[4] group: Other developers who work on the site. For this category of people, there is a progress bar to view their progress and distance to the other two groups and work more and more on the site to improve their position.

Competition at the local level

Due to the patriotism of any person, the competition between the nationalities of the developers motivates them to participate in the responsiveness and promote the rank of their countries. Meanwhile, competition between countries is a permanent process and, in contrast with the achievement of a special badge and medal, does not diminish the motivation of individuals to participate.

At this level, ten people who have gained the highest privileges at the local level and in all countries compete. The users of each country are meant to have their geographical location recorded in a country/city. Thus, the total score of these ten people is calculated as their country's privilege. After calculating these privileges, the scoreboard of all countries where their users have contributed to the site is created. The name of the countries along with the rank among other countries as well as the total privileges of their users are displayed in this table.

3.3. Reward mechanism

The reward system is one of the key components of the gamification system that motivates developers to continue working. Due to the impossibility of providing material rewards on the Stack Overflow site and the importance of the presence of users on the site, in this research, reward policies are explained so that they can motivate users to continue participating in the site by fulfilling their non-material needs. In the following, the rewards that users receive if they obtain the desired privilege are described.

1. Displaying score questions: Given the scoring policies in this research, answering some questions will increase the score more than other questions. For example, questions that have long been overlooked, have not been answered, or have not received acceptable answers, or questions raised by the top developers' group, which have no acceptable answer, will cause a significant increase in privilege. The pattern for finding questions and displaying them to increase the privilege is as follows:

---

[1] Top 10 people who have gained the highest privileges in the same country.

[2] Top 30 people who have gained the highest privileges in the same country, having lower privileges than top developers.

<div style="text-align:right">)   " " (3</div>

.   heroes   "   " .

.   "   " "   " 4

- Displaying unanswered questions as well as questions that have not received an acceptable answer.
- Displaying questions that the user has already answered, but that answer is not acceptable.
- Questions raised by the top developers and heroes group on the site and have not received an acceptable answer.

2. Providing the opportunity of advertising and displaying features and specifications in the bulletin section: In this research, the bulletin boards were included in the extension so that individuals can introduce their own talents and distinctive features or advertise their software products. This opportunity is available to people who have been able to earn the most privileges within three successive weeks. In this bulletin, in addition to displaying the profile of the person, the text posted by that person is displayed to other users. This text can be a resume, product introduction, company promotion, etc. The purpose of this section was to provide free and functional services to people for their efforts on the Stack Overflow website.

3.4. Integration of the phases and providing the complete tool

To integrate the preceding phases and provide a complete tool, an extension was designed for the Eclipse environment and the Java scripts, in which the user can initially log in by the Stack Overflow information. In this way, the location and country/city of the user will be determined. Along with this extension, a web-based service was created to calculate user privileges according to scoring policies of this research.[5] Since privileges on the Stack Overflow site are calculated daily and at 3 am, the Windows of privileges calculation service in this research was also executed daily and at 5 am US time, and user privileges were calculated and stored in the database. The information stored at the time of user's login to the extension was used to compute that information:

- Individual privileges, the group in which the individual is included by its privileges, and the difference in privileges with the higher rankings and the progress toolbar.
- The privileges of countries and their ranking, as well as the rank of the home country of the individual, the effectiveness of that person in obtaining this rank, and the difference in privileges with the higher rankings

Calculated items are displayed graphically for any person. At the same time, motivational sentences are used to persuade the person to participate in the site. If the person wants to participate in answering, he can click on the list of questions in the extension. In this extension, the questions are sorted on the basis of their dates and the most or least visited.

3.5. The working procedure of the proposed extension

The purpose of this section is to explain the performance procedure of the proposed extension step by step.

The performance procedure of the proposed extension includes the following steps:

1. User login using Stack Overflow information and receiving information including country/city, country rank in the scoreboard, the degree of the user's effectiveness in earning this rank, the difference with higher ranks and local ranking of the person.
2. Passage of time set in the extension and displaying motivational sentences to participate in answering questions depending on the country ranking of the developer in the scoreboard.
3. If the person wants to contribute, he can click on the extension and will see the list of questions.
4. By choosing any of the questions, the person is directly connected to the relevant question and is able to answer it.
5. After each answer and clicking on questions in the software, motivational sentences and incentives are displayed for the developer.

Fig. 2 shows a part of the extension that shows the ranking of 1st to 3rd countries, as well as the ranking of the user country along with the countries higher and lower in the standings. As shown in the figure, there is a key to display the questions that answer to them will earn privileges and thus promote the standing of person's nationality, by which the person can view the list of questions and answer them.
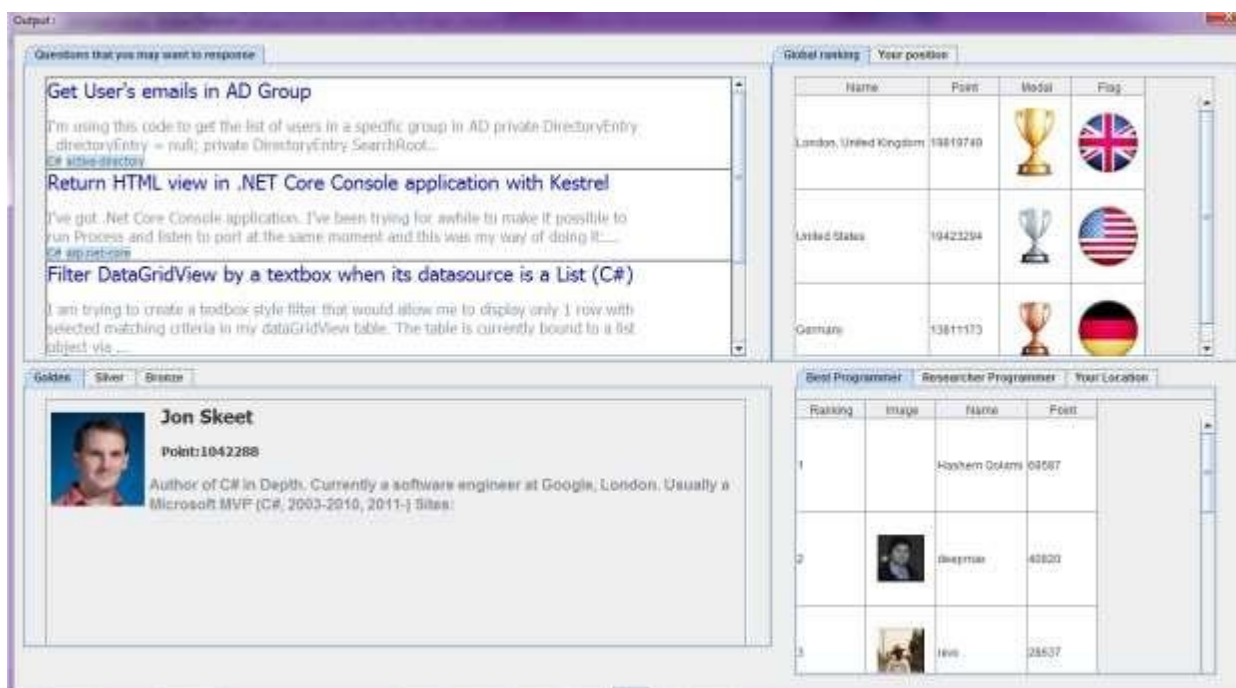
<div style="text-align:center">.   "   "</div>

5

Figure 2 – Extension demonstration

4. Analysis
4.1. Research Questions
The proposed solution will be evaluated in the following. To achieve this, generally, two issues need to be evaluated.
- Evaluating the performance of the proposed solution in the form of an Eclipse extension
- Evaluating the effect of using this solution in Stack Overflow questions

Therefore, the following two questions were introduced as the research questions:
1. $_1$: Does the developed extension help the programmers for the efficient partnership in Stack Overflow?
2. $_2$: Is the proposed solution effective in the improvement of Stack Overflow website in eliminating the problem of the visitors?

Both evaluations will be elaborated in the following. In each section, the evaluation setup is first introduced. Then, the evaluation results are mentioned. Finally, the quantitative and qualitative analysis of the results will be carried out.

4.2. Evaluation of the performance of the proposed solution in the form of the Eclipse extension
1. Evaluation setup
Five programmers with 4 years of programming experience were invited to evaluate the aforementioned extension. In order not to disturb the work of the programmers, the extension receives a ranking of the countries and the list of the proposed questions only by clicking the information in a moment. The programmers were asked to work on the Stack Overflow website for a week so as to promote the ranking of Iran.
2. Results of the performance evaluation of the proposed solution
- Building motivation for participating in responding

The purpose of this section was to evaluate the performance of the extension in motivating the programmers so as to participate in responding to the questions. To achieve this, the users were asked to specify the level of participation in the Stack Overflow website during this week. The results of the questions asked from the programmers are presented in table 1:

Table 1. Results of the evaluation of motivation and participation in the Stack Overflow website

Participants	No. of the questions answered in 1 week	Total time spent (hour)	Percentage of the increased participation in responding the questions	Percentage of the increased time spent on participation in responding
Programmer 1	14	17	75%	88%
Programmer 2	11	10	70%	75%
Programmer 3	10	13	72%	75%
Programmer 4	17	15	80%	90%

Programmer 5	13	9	68%	72%
Mean	13	12.8	73%	80%

- **Sense of Satisfaction**

The purpose of this section was to examine the programmers' sense of satisfaction after participating in responding to the questions of the Stack Overflow website. To achieve this, the users were asked to specify their willingness to continue participating in the Stack Overflow website as well as their sense of satisfaction. The results of the questions asked from the programmers are presented in table 2:

Table 2. Results of the evaluation of the sense of satisfaction for participating in the Stack Overflow website

Participants	Willingness to participate in responding	Sense of satisfaction vs. sense of obligation	Percentage of the increased participation in responding the questions in the future compared to the past
Programmer 1	Yes	Yes	80%
Programmer 2	Yes	Yes	70%
Programmer 3	Yes	Yes	75%
Programmer 4	Yes	Yes	90%
Programmer 5	Yes	Yes	85%
Mean	100%	100%	80%

- **Earning score**

This section was designed to examine the proposed strategy to increase the score of programmers by participating in the Stack Overflow site. To this end, programmers were asked to specify the effectiveness of using the extension in earning a score. Table 4 shows the results of the questions from the programmers:

Table 3 - Evaluation results in the field of performance the extension for improving the score on the site Stack overflow

Participants	Percentage of the usefulness of the extension in upgrading the nationality rating	Percentage of the usefulness of the extension in the upgrading of individual score	The more percentage of the programmers' participation in the upgrading of the score
Programmer 1	65%	70%	90%
Programmer 2	60%	70%	95%
Programmer 3	55%	75%	85%
Programmer 4	65%	75%	70%
Programmer 5	63%	75%	70%
Average	61.6%	73%	82%

4.3. Evaluation of the impact of using this solution in the questions of Stack Overflow
1. **Evaluation Setup**

In order to evaluate this section, 65 of the questions asked by the programmers in the first evaluation were used. These 65 questions and their responses were evaluated by 3 programmers with at least 6 years of programming history. Programmers were asked to specify the effectiveness of the responses to improve site performance and removal of programming problems. In fact, in this section, quantitative and qualitative evaluations of responses were made. With the help of this evaluation, the impact of our approach was determined.

2. **Results of the evaluation of the impact of the proposed strategy on the questions of Stack Overflow**

Some of the results of this section are specified in Table 5.

Table 4 - Evaluation results on the performance of the proposed strategy

Participants	Number of questions answered	Percentage check the quality of given responses	Percentage of problem-solving by the solution by considering the type

1258

			of question
Programmer 1	14	70%	80%
Programmer 2	11	75%	80%
Programmer 3	10	90%	90%
Programmer 4	17	65%	70%
Programmer 5	13	70%	75%
Average	13	74%	79%

4.4 Quantitative Analysis

The following results can be seen from the results obtained in the Tables:

- According to Table 1, using the growth extension, 73% of the participation in the Stack Overflow site can be seen.
- According to Table 1, using the growth extension, 80% of the time spent on the stack overflow site in order to respond and participate can be seen.
- According to Table 2, 100% of programmers tend to use the extension and participate in responses.
- According to Table 2, the percentage of programmers' participation in the future and the end of the evaluation period has risen by an average of 80% over the past.
- According to Table 3, the percentage of the usefulness of the extension in upgrading the country's score is 61.6%.
- According to Table 3, the usefulness of the extension in upgrading the individual score is 73%.
- According to Table 3, the more percentage of programmers' participation involved in upgrading a score by motivating the extension is 80%.

4.5 Qualitative analysis

- According to programmers, a large number of questions of Stack Overflow site are unanswered. At the same time, a considerable number of questions that have the answer are unacceptable. This can be because there is not enough incentive to participate in answering site queries for expert programmers.
- According to programmers, a number of programmers have not the incentive to continue to participate after participating in the site, earning score and receiving a medal. This can be due to the fact that awarding a medal on the site is an interesting way, but it certainly cannot be a perfect way to motivate the constant participation of programmers.
- By examining surveys, motivating to answer questions and encouraging more score earns more complete and accurate replies. That's why using the extension not only adds more to the programmers but also overcomes the problem of incomplete and incorrect responses.
- Reviews after the end of the week show that the use of the extension has become habitual for programmers and they are interested in becoming more participation in Stack Overflow's response, regardless of review time and earn score.
- Regarding the reviews in the auto-ranking display in comparison to the voluntarily display and by clicking the extension, it was determined that since the programmers click on the extension voluntarily, they tend to participate in the site and, after that, they give more complete and understandable answers. At the same time, the focus of the programmers does not disturb it work and is more inclined to use the extension.
- Studies show that most programmers are not reluctant to log in and consider this a waste of time. So for the convenience of the programmers, there is no need to log in to view the ranking and display the suggested questions and this ad is given to programmers who log in for the promotion of a national score only when they answer questions and participate in the site. This makes it easy to use the extension.
- Studies show that programmers responded while using the extension, in addition to answering the questions displayed in the suggested questions section, as well as other questions that were considered randomly or through a search on the site and this illustrates the success of the extension to motivate responding to questions that responded, but according to programmers, they could have a more complete and better answer.
- Motivated by the competition between nationalities, though, is the purpose of this extension but all the programmers participating in the evaluation believed that it would be useful to have the main reasons for continuing the use of the extension.
- All programmers participating in the evaluation believed that answering questions and participating in the site would increase the knowledge of programming and promotion of their scientific knowledge. Yet, it has been seen that programmers have spent time studying and answering questions that do not accurately answer their responses to provide useful and effective responses, including the benefits of using the extension.

Conclusion. In recent years, due to the development of programming languages, there has been an increase in the number of query and response sites such as Stack Overflow. Despite the use of gamification tools on this site, we are still faced with a significant amount of questions that either no response has been recorded or an acceptable response has not been identified. Since this site is one of the most important sites that are listed for free to fix issues and programming problems, the number of visits from the site is higher than other programming sites and more people visit this site to fix the problem. Therefore, the high number of unanswered or lack of acceptable response to questions causes the problem of programmers to be avoided at first visit and does not require more searches and more time for programmers. In order to solve this problem, we have explored methods that, by motivating more programmers, increased participation in answering questions, thus reducing the number of unanswered questions, as well as raising questions with acceptable answers. Among the solutions, we have chosen to create a rivalry between the programmer's nationalities based on the score obtained by the programmers of those countries on the Stack Overflow site. Then we designed an extension that calculates country ranking and displays the effectiveness of each country's programmer in earning this rank and encouraging programmers to contribute to improving their country's ranking by answering more questions. At the same time, other methods of the proposed questions, including the most viewed show method of unanswered questions, as well as the most viewed show of questions without acceptable responses, are suggested methods for participating in the Stack Overflow site.

We have evaluated this solution in two sections. In the first section, 5 programmers used the extension and evaluated their performance. In the second section, 3 skilled programmers have evaluated the results of using the extension in the questions of the Stack Overflow site. The first evaluation participants considered the proposed the extension to be helpful in responding to the site. The second evaluation participants believed that the responses sent by the participants who used the extension were of an acceptable quality.

The details of the evaluation results are as follows:

- The programmers believed that by using the extension, a 73% increase in participation was found on the Stack Overflow site.
- Using the growth extension, 80% of the time spent on the stack overflow site in order to respond and participate can be seen.
- In the evaluation, between 5 programmers revealed that 100% of programmers tend to use the extension and participate in the response.
- In the evaluation, it was found that the average percentage of the usefulness of the questions in reducing the time spent responding and participating in Stack Overflow site is 73%.
- According to programmers participating in the evaluation, the average percentage of the usefulness of the questions in the earning score is 69%.
- Also, the percentage of the usefulness of the extension in improving the country's score is 61.6%.
- The more percentage of programmers' participation involved in upgrading score by motivating the extension is 80%.

5.1 Strengths and weaknesses

- **Strengths**

One of the most important strengths of the proposed solution is to create a consistent incentive for programmers to respond to the questions in Stack Overflow site. Because the programmers of other countries are answering questions, leaving the participation in answering questions by the country's programmers leads to more differences between ranking in the table and falling down into lower grades. This solution is not limited to specific geographic boundaries and time and space, and since programmers can identify their specialized fields according to their interest and work history, they are not limited to a specific set of programming questions. At the same time, by observing the ranking table, countries can be ranked in terms of programming intelligibility and accountability, which is a good incentive to participate in answering questions for programmers and is a potential feature of the extension. You do not need to quit the program to find and study the suggested questions and this is another strength of the extension. The intelligence of the display of questions to answer is other obvious features of this extension. In this extension, questions are displayed that the correct answer to these questions will earn a score and improve the ranking in the ranking table. These questions are frequently viewed, and the correct answer can solve the problem of a large number of programmers who have encountered this problem. Reply with the aim of earning score make programmers respond more accurately to get the most score of this response, reducing the number of questions that do not have acceptable answers, and this is another strength of the proposed strategy.

- **Weaknesses**

One of the weak points of this solution is that since the ranking is based on scores, there is a significant delay between the response time to a question and earning scores and upgrading in the ranking table. By encouraging participation in the site, it can be used to encourage programmers to participate in the upgrading of the score, thus reducing this time.

5.2 Threats against credit

- **Internal credit.** Independent variables such as external factors may affect research outcomes and threaten the project. In this research, a person's identity is identified when using the extension for identifying the nationality of the individual, which may be problematic for this research. Because programmer may use this extension, therefore, a country other than the home country of the programmer will be selected as the nationality, which will be problematic in this study. To solve this problem, we put a section in the extension so that users manually select their nationality from among the displayed countries. This avoids any ambiguity in identifying users' home. At the same time, people who have participated as a programmer in the evaluation and consultation process can also create internal analysis. To overcome this problem, it has been tried to use the Stack Overflow site from well-known and committed programmers at various stages.

- **External credit.** The external credit answers this question whether the results of the research can be generalized to other places? In fact, this credibility indicates how is generous the research and how it can be used to solve similar problems. Because the ranking criterion in this study is the medals given to users by the Stack Overflow site on other Q & A sites, if there is a system for earning score, and yet, there is an appropriate user interface to receive ranking information based on the country, it is possible to use the results of this research. It is also possible to add this extension to all open source programming environments and there is no limit to the type of programming language.

- **Build credit.** The build credibility answers the question of whether the proposed strategy is theoretically defensible. In fact, is this credibility indicative of whether the results have been predicted after and before the project? The fact is that considering the attractiveness of various nationalities in competitions such as the Olympics and other sports events, and other things that national motivation is motivating and trying to achieve the goal, the success of using the extension was foreseeable. At the same time, the history of using gamification tools on the Stack Overflow site and past successes were also a predictor of the success of the proposed the extension.

- **Reliability.** Reliability relates to the question of whether the results obtained in this study if repeated in the same conditions are still achieved. The display of the ranking of countries is a non-random process. Also, the display of countries in a higher class and a lower category is also non-random, and if the repetition is still the same. And the effectiveness of a person in achieving this position is a definite process. In the section on displaying suggested questions, the questions that are not answered or the acceptable answer for it is not recommended, but it is not suggested for the choice of any random probabilities and this item does not disturb the reliability of the proposed the extension.

5.3 Suggestions for future work. In the future, we plan to extend the question's offer in order to earn a higher score in a smarter way. For example, the ability to ask a question to a specific person is based on experience and work history. In addition, in order to improve the quality of responses, we will implement a gamification policy to give an answer to the correct answers. At the same time, we decided to explore more and more gamification elements.

References

1 M. Asaduzzaman, S. Mashiyat, C. Roy and K. Schneider" ,Answering questions about unanswered questions of Stack Overflow ",in: *Working Conference on Mining Software Repositories, pp. ,100–97IEEE Press* .2013 ,

2. B. Amir and P. Ralph, "Proposing a theory of gamification effectiveness," in: *ICSE Companion 2014 Companion Proceedings of the 36th International Conference on Software Engineering*, 2014.

3 S. Forde, E. Mekler   K. Opwis" ,Informational vs. Controlling Gamification: A Study Design ",in: *CHI PLAY '15 Proceedings of the 2015Annual Symposium on Computer-Human Interaction in Play* .2015 ,

4 R. Slag, M. d. Waard and A. Bacchelli" ,One-day flies on StackOverflow: why the vast majority of StackOverflow users only posts once ",in: *MSR '15Proceedings of the 12th Working Conference on Mining Software Repositories* , .2015

5 .Y. Jin, X. Yang, R. G. Kula, E. Choi, K. Inoue and H. Iida" ,Quick trigger on stack overflow: a study of gamification-influenced member tendencies ",in: *Proceeding* .2015 ,

6 *2014Proceedings of the 14UCC '* in: ",Adaptive Approach for Gamification Optimization" ,G. Ravid and D. Codish .2014 ,*th International Conference on Utility and Cloud Computing7IEEE/ACM*

7 N. Kraft, "Building reputation in and A. Bosu, C. Corley, D. Heaton, D. Chatterji, J. Carver   ]35[MSR '13 Proceedings of the 10th Working Conference on Mining ",StackOverflow: an empirical investigation .Software Repositories, 2013