Assignment Assistance System

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Abstract*— Assignment Assistance System is a web-based system purposed to provide guidance for target users (i.e. students) in undertaking assignments. The system will provide relevant resource materials to be used for reference purpose when doing the assignment. It helps overcome the risk of those without a clear understanding of the assignment scope, simply going online to find some related reference without checking the validity of the document scope and including such material in the assignment. This platform is able to provide better resource materials for students to brainstorm ideas for the assignment. It also provides a convenient and direct method for student to reference the resource as some online documents are restricted and difficult to refer when doing assignment. Performance tests concluded that the system was able to cope well with simultaneous users, although a more attractive user interface recommended by the user acceptance test.

Keywords— Search engine optimization, SEO, Resource finder, Web application, Brainstorming strategies.

I. INTRODUCTION

Assignment Assistance System (AAS) is a web-based system designed to help users with difficulty in assignment completion and those lacking a clear understanding of the assignment criteria. The purpose of this proposed system is to provide students with the ability to acquire appropriate resources in a shorter time and without being sidetracked by irrelevant and invalid resources. The proposed system also provides guidance to the student in identifying solutions for the assignment without missing major considerations. A search engine optimization tool will also be introduced to provide students with optimized search engines to seek out the resource materials. Additionally, the lecturer can also upload resource materials and supervise the student who has accessed the content.

The main motivation for such a system is that many students struggle to find the right resources as references when undertaking assignment documentation. Often, the student just does a simple search without doing the necessary due diligence, and includes the materials found into the report, even if there were factual mistakes and invalid sources. Such haphazard work could then cause the student to lose marks. In fact, there are too many online resources available, and it can be difficult to discern which are trustworthy, which can cause the student to be confused in trying to distinguish the important and relevant information that could be used as a reference. Besides, it also takes time to find the tools on the internet and can be perplexing for students to look for relevant search results on several information websites with similar references.

There are too many online websites that provide resource sample, such as Scribd, Chegg, Course Hero, Google Scholar, and others. Therefore, the sheer volume of resources available via digital e-library websites, resource articles, documents, and many other types of materials, makes it difficult for the student to narrow down the search to locate materials that the student actually needs. This large volume of information and tedious process often renders students being unable to select which resource materials to use as references for the assignment. In addition, there may be some restriction on certain websites or resource materials, whereby access may be subscription based. Some of the most relevant resource material are these paid documents and websites.

Assignment Assistance System provides the user an alternative solution to obtain useful sample resource as reference in constructing assignment. Through the implementation of this proposed system, students would benefit in their learning experience. Building an idea solution that is encouraged by a specific module would certainly increase the student's performance and passion while completing the assignment. Furthermore, it might provide the student with a wealth of relevant resource materials. Through search engine optimization, the student would be able to get more accurate search results of resource material. Besides that, the system would learn the search pattern of the user and prioritize keyword search results for the frequently used resource materials. Moreover, the system helps lecturers trace student who visited the resource materials, and detect plagiarism.

II. SIGNIFICANCE OF THE RESEARCH

A. Web Design

A website design is an important factor that needs to be considered during the optimization of the search engine. For instance, flash animations lower the web page loading time, but are necessary for modern website aesthetics, hence, a limited number of them would be used to ensure better evaluation results. A useful website must have simple structured content that can be indexed easily and preferably, web pages must be provided in HTML format. Besides that, a good navigation structure that provides an easy access to the sub-pages must be developed [10].

An analysis was carried out to achieve an effective e-commerce website, and the advertising point of view is that the key factors that could affect the attitudes and behaviors of online users. Web design is described as a significant factor in

the adoption and popularity of websites and e-commerce. Having high-quality information, good content and a powerful and attractive navigation are important in developing websites.

B. Search Engine Optimization

Search Engine Optimization (SEO) helps a website to appear in the top search engine result lists for some keywords [10]. SEO is basically based on suitable keywords that can be used for search engines to have a more optimized search result. To optimize the website for a search engine, it must be tailored to certain technical requirements. The process in described by Fig. 1.

Fig. 1. Search Engine Optimization Process

C. Search Engine Optimization Tools

For a website, the SEO tool is important when searching for relevant results. SEO is the process of using natural search engine results to increase the quantity and consistency of traffic on the website. SEO uses top search engine search results to prioritize a website. Immaterial of whether static and dynamic, available plugins could be used to run SEO.

There are four main categories in SEO: keyword / key term website search and collection, website indexing for search engines, website factor optimization on-page, and website factor optimization off-page. Google Keywords tools, as in Fig. 2, was used in the first section to search and pick keywords for the website. The website is submitted to different search engines and directories in the second category. A ready module system is used in the third category to optimize on-page components, such as meta tags, page content, and site navigation.

SEO as a comprehensive approach used to improve a company's placement or products in natural or organic search engine results listings for specified keywords or phrases. SEO is an Online marketing technique and a commonly used method by search engines to increase customer traffic volume and quality to the company website [6]. The website's user experience and success in search results improves when paired with the website SEO technique.

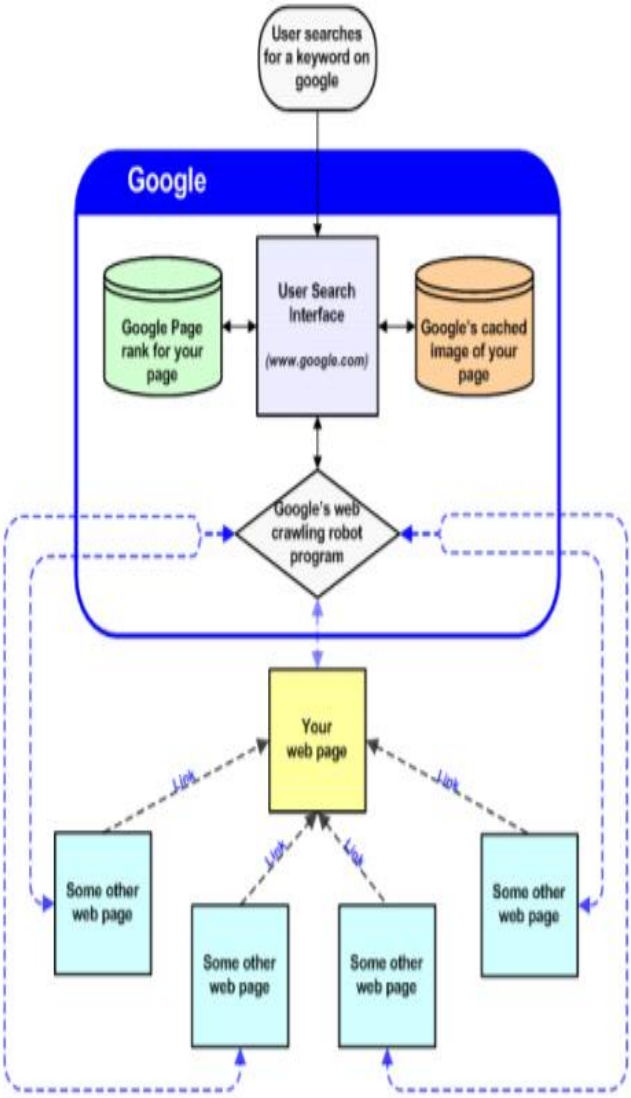

Fig. 2. How Search Engine Optimization Works

SEO requires significant time; skilled communicators must apply these lessons slowly in the sequence outlined in this paper and should keep up to date with frequently changing ranking algorithms and the associated changing SEO practices. In SEO, access control systems decide if a device request is permitted on the basis of a set of predefined static rules. Query Processing is one of the framework modules – it is the first unit of SEO, where the request is received. Once the result is obtained, it is verified and retrieved from the server and gives the user-requested query to the particular result, providing high visibility to the website during user search [15]. SEO creates or changes a website in such a way that it is easier to both crawl and index content for search engines.

Academic SEO (ASEO) is the development, publication, and modification of academic literature in a way that makes it easier for academic search engines to crawl and index it. This differs from the typical SEO in four significant aspects: (1) Web Search by using Google Scholar, (2) Webmaster, as the webpage is linked to an indexed page, (3) Webmasters can alter their pages by inserting or removing words and links, and lastly, (4) web search engines index all text on a website. One

of those search engines that blends many variables into one rating algorithm is Google Scholar. By gaining importance, the number of citations, the authors name and the name of the document's publication increase in importance [3]. SEO in a website is crucial in the proposed title Assignment Assistance System.

D. Integrity Issue

1. *Plagiarism of Academic Integrity*

Academic integrity is an issue faced by many students when it comes to doing any academic study. Academic integrity is the dedication and presentation in an academic setting of truthful and moral behavior. This is of vital importance in university education as it relates to giving credit when using ideas from other people. Plagiarism is perceived to be a failure to provide such recognition, whereby the student will copy and paste or just make minor changes when doing the assignment. Plagiarism happens in every aspect of our daily lives and occurs knowingly and inadvertently in some cases. Plagiarism are cause from quoting verbatim, paraphrasing, auto plagiarizing previous work or misleading referencing source [7]. Studies have highlighted the common factors for student plagiarism, including poor time management, lack of trust and misunderstanding of conventions [7].

2. *Data Protection*

Data protection must be emphasized as all the resource materials and user confidential information will be stored in the database server. Therefore, a strong security layer is needed to withstand any breach of data security. Data outsourcing to external servers to store the data might be sensitive unless provided such protection [12]. Data encryption is also a method for securing the information, whereby data encryption can be achieved by adopting either symmetric or asymmetric encryption schemas. On the other hand, [14] mentioned that cloud computing providers such as Amazon Web Service (AWS) ensures confidentiality, integrity, and availability of the customer's data. Such services make it easier to undertake the work without any delay [14].

Data protection is highly prioritized in the Assignment Assistance System. This is to prevent restricted resource materials from being obtained by the student easily and prevent manipulation of the access authority of the materials. Therefore, data encryption and Internet protocol Security (IPsec) are used to protect the resource materials. A server-to-server protection is crucial to protect the confidential information and the available resource sample materials in the database. Installing a backup server is also a type of protection when there is data loss or if the main server down, as the backup server will activate to replace the main server.

3. *Brainstorming Ideas*

Brainstorming of ideas is important when it comes to thinking of idea for solutions in doing an assignment. Brainstorming is a way of generating ideas and organizing the thinking process for a topic. Brainstorming will help to set the student's mind in motion and helps to find concrete idea when they are feeling anxious about an assignment or lack inspiration. This is because when there are too many ideas and one is not sure as to which idea to pursue, brainstorming is able to narrow down the scope.

Brainstorming includes the use of certain principles created by Osborn who coined 'brainstorming' for the open-flowing burst of ideas that he and his peers tried to promote [11]. Understanding the generating, processing, and sharing of ideas requires knowledge of the cognitive, social, and motivational factors involved in both group and individual brainstorming. There are many ways of brainstorming for an assignment, as students think and learn differently. Fig. 3. shows how the social-motivational factors might influence the cognitive process of individual idea generation [11].

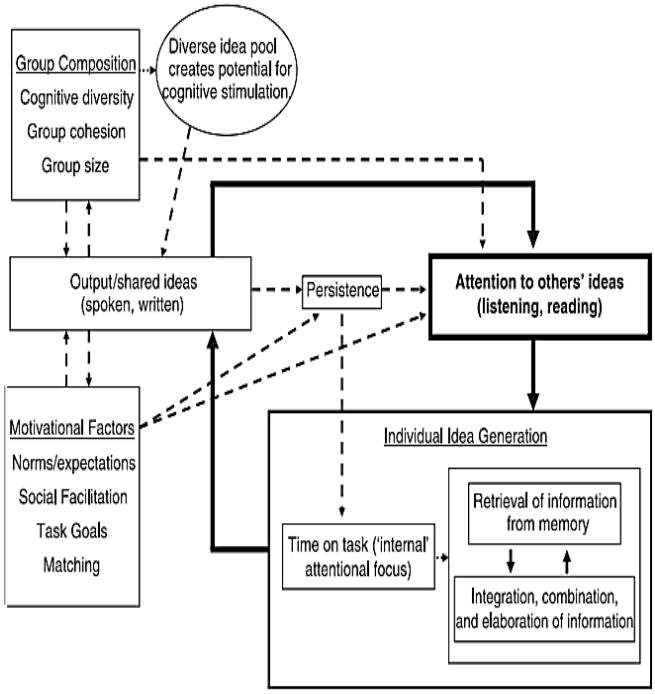

Fig. 3. Cognitive Social Motivational Model

Individual idea generation is assumed to involve the integration and combination of information retrieved from memory and is assumed to be strongly affected by both the degree to which an individual focuses on their own idea generation process and the degree to which they attend to the ideas of others. Whereas, group brainstorming provides a clear empirical and theoretical basis for understanding everyday group interaction in any situation that involves exchange of ideas. Sometimes, individual brainstorming of ideas for an assignment is less productive as compared to discussing ideas with group members, as brainstorm together allows for exchange of ideas. Doing assignment as a team is believed to have a better productivity.

Research shows that using various forms of brainstorming techniques enable individuals the ability to generate quality ideas to solve complex problems in any situation [5]. Fig. 4 shows the factors in a discipline specific context will provide a basis for future strategies to effective brainstorming practices and provide a useful reference to develop certain idea creativity for academic purposes. By using these techniques of: (1) traditional brainstorming (TBS) on the creative thinking side, (2) electronic brainstorming (EBS) on the ideas generation, and (3) non-redundant and nominal brainstorming (NBS) to facilitate ideas generation to increase the quantity and quality of ideas, satisfaction, positive

perception, and performance of individuals. With the guidance of the Assignment Assistant System, students would be able to make use of the different brainstorming techniques to generate ideas for the assignment.

[5] concluded that, among the 3 brainstorming techniques, EBS is felt to be the most reliable and realistic solution on the brainstorming session based on the Fig. 4. The EBS techniques was also found to be the most reliable and suitable with the concept of the proposed system, whihc is to provide a platform that allows students to share the resourse materials with the others by getting alternative ideas while doing an assignment. The lecturer will able to assess the students' progress and understanding in doing the assignment.

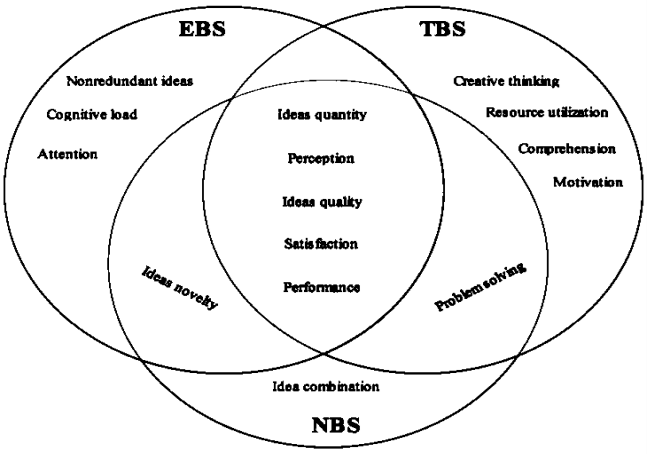

Fig. 4. Brainstorming factors over discipline

III. RESEARCH METHODOLOGY

The waterfall model software development lifecycle was used in the development of the proposed system. The main stages are as shown in Fig. 5 and described below.

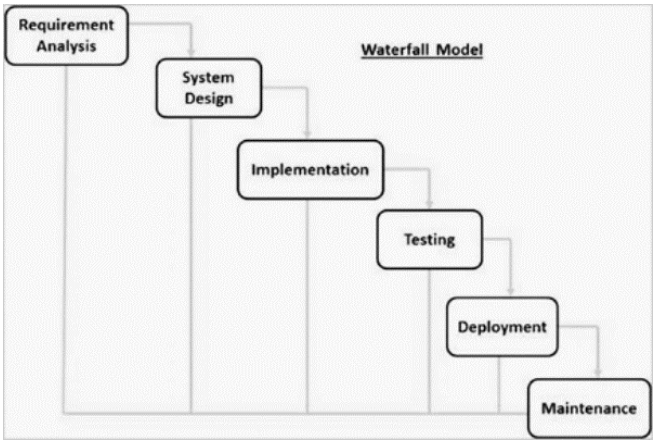

Fig. 5. Waterfall Model

A. Requirement Analysis (planning)

During this initial phase, all potential system requirements are researched, collected and recorded in a specification report. Functional and non-functional requirements, as well as research on technical techniques are conducted in the requirement analysis phase. Literature review on the areas of study, i.e. the system features that need to be implemented, issues in web search engine optimization, web development, integrity issues, data protection, document review, and data analysis, is undertaken to evaluate the advantages and disadvantages of the various techniques and approaches in developing the Assignment Assistance System [4]. Functional requirements describes what the software system should do, including the system graphical user interface and the functionality features, while non-functional requirements pertain to how the system will do them, which includes analysis on documentation, testability, availability, maintainability, robustness, and others technical analysis.

B. System Design

In this phase, specification requirements are learned from the first phase and the development of the device is planned [2]. The overall system architecture is specified and presented in several UML diagrams, including class diagram, use-case diagram, sequence diagram, state diagram and entity relationship diagram, designed on the basis of data gathered from the literature review and document review prior to the system implementation.

C. Implementation

System design inputs are first developed in small programs called units. Every unit is implemented and tested for its functionality, known as Unit Testing [2]. In the implementation phase, after the code was developed for the proposed system, unit testing is conducted on the multiple small parts, where testing is conducted on several modules: login, registration, manage resource, manage user log, user profile and others.

D. Integration and Testing

After testing each unit, units built during the implementation phase are integrated to form the complete system. The entire system is tested for any flaws or errors. Integration and testing phase, where the integration testing, user acceptance testing, performance testing and stress testing are conducted for this Assignment Assistance System [8]. These tests are conducted with a few students volunteers who were interested to experience the system. Bugs and errors are recorded and some enhancement changes are made to ensure that the system operates well.

E. Deployment of the System

After the functional and non-functional testing is performed, and the necessary corrective actions taken, the product is released to the market in the consumer environment. Options for bug reporting, feedback and upgrades are incorporated. The target users of the system is students and lecturers. However, upon deployment, consumers from other sectors may also be interested to try out the system, and their feedback would be collected as well.

F. Maintenance

In the last phase, any problems that were faced in the consumer environment, are identified and the necessary fixes developed. In maintenance phase, minor and major enhancement are made. Patches are published to fix issues.

Some new versions are launched to improve the service as well. Maintenance is conducted in the consumer environment to implement these improvements. Continuous maintenance is an on-going process.

IV. RESEARCH VALIDATION

A. Data gathering and analysis

Research on the effect of using brainstorming strategy in developing creative problem solving skills on the 98 male student at the Saud Al-Kharji School in Kuwait City [12] is referred. The results obtained is shown in Table 1, separated into a control group and experimental group. The average score for pre-test was 14.4 and post-test 73.76 [9]. This work supports that brainstorming played an important role in improving students' understanding. Therefore, the use of this strategy is appropriate for the proposed system by brainstorming whilst doing assignments.

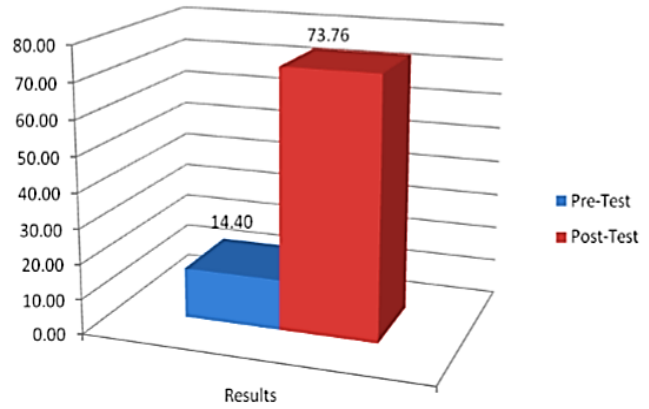

Fig. 6. Pre and Post test for Brainstorming

B. Search Engine Optimization Strategy

For good search engine results, the basic optimizing strategy is crucial. The strategy consists of page title, keyword optimization, improve click and link popularity, and internal links of the website. Compactness of keywords is the ratio between the number of keywords and the number of webpage terms, which are the most important factors in the strategy of optimization. Click popularity in search engines is a very important factor for website rating. The page's frequently clicked popularity will be high, as used in facebook.com [13].

C. Search Engine Algorithm

Search engine algorithm is a set of rules or a special equation used by the search engine to evaluate the web page's importance, and each search engine has its own set of rules. [13] studied several of search engine algorithms. There are page rank algorithms, hilltop algorithms, and new algorithms for search engine. Page Rank Algorithm, originating from Google's creator, Larry Page, is used to identify the importance of different web pages at rates 1-10, where the higher PR rank (Page Rank value) is preferred. The PR is calculated as follows [6]:

$$PR(A) = (1-d) + d\{PR(t_1) \dots PR(tn)/C(tn)\} \quad (1)$$

Hilltop Algorithm is a rapid positioning method subject to the "expert" classification proposed by Krishna Bharat and George A. Mihaila, which Google applied to the front end of Page Rank. It specifies weight. The application is initially processed with the Page Rank Algorithm used for calculations when nothing is checked for. Eventually, the relevant ranking is performed by comparing two algorithms according to the outcome ahead [13].

A new algorithm for the search engine that Google uses from its Page Rank and Hilltop sequencing technology to rank a web page. The new algorithm is made up of three parts: RS Correlation Scores, PR Page Rank Scores and LS Industry [13], and is given as follows with a, b and c being weight controls, whilst d, e and f are damping controls, and fb is the base variable..

$$\{(1-d) + a(RS)\} * \{1-e) + b(PR * fb)\}\{(1-f) + c(LS)\} \quad (2)$$

D. Test plan for Performance Testing

Performance testing determines system variables in terms of reactivity and reliability under various workload. Performance testing evaluates the system's quality attributes, such as speed, scalability, efficiency, and resource utilization. Performance testing is carried out via the load test of the website using Microsoft Azure App services. This is to test the Assignment Assistant System website's performance with several simultaneous users and to assess whether the website is ready for release [12].

Before that, there is a necessity to test different workload performance to produce different results. Thus, S1, S2 and S3 scale up plan in Azure is used to test the differences of the S1, S2 and S3 in terms of the cloud computing unit ACU, RAM and storage. Each scale up plan runs the same configuration, as described below.

Step 1: In Azure Portal application insight, select Performance Testing.

Step 2: Run Test by testing the load from 'Southeast Asia', 1000 user load and duration 5 minutes (see Fig. 7).

Step 3: The result obtained is shown in Fig. 8.

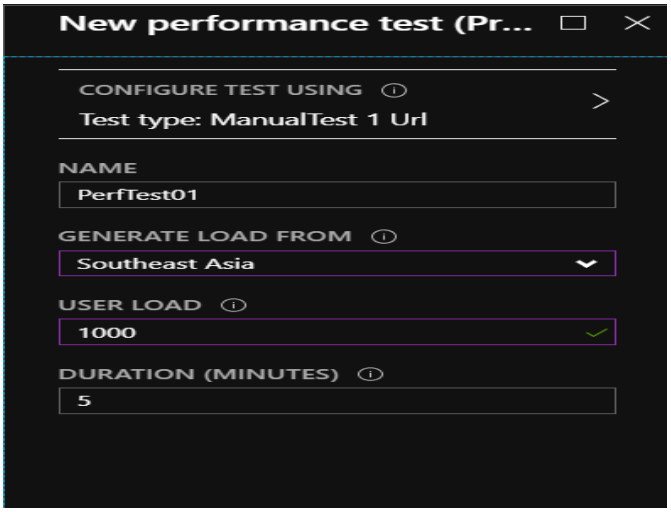

Fig. 7. Configuration

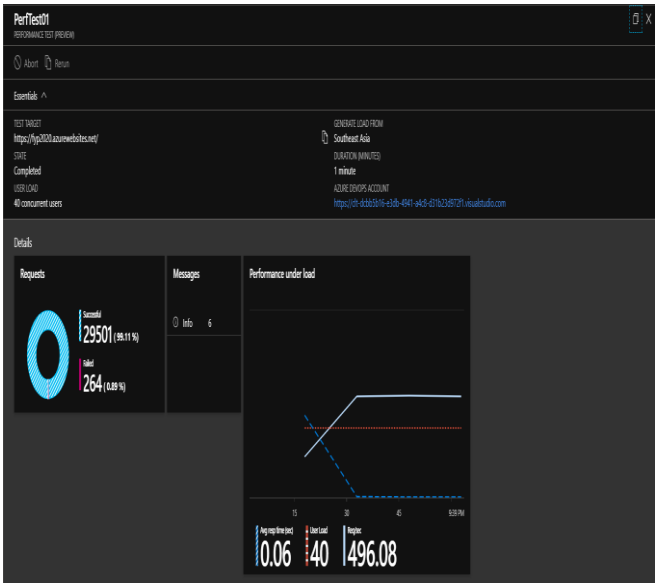

Fig. 8. Result produced

The test results show that the proposed system is able to handle simultaneous users successfully. This signifies that it would be able to cope with the consumer environment.

V. CONCLUSIONS

This work proposed the development of an Assignment Assistance System. The background problem and potential benefits of the system, the target user of the system and scope were described. Domain research on the core function of the system and a comparison of systems such as ApSpace, Scribd, and Course Hero, were undertaken to establish the requirements and consequently the specifications. Technical research of the software and tools for implementation resulted in Visual Studio as the IDE, C# as the programming language and MySQL for the database. The system was designed and then developed as modules to facilitate unit testing, before being integrated as a complete system.

A series of testing was conducted, including a user acceptance test with target users to gain feedback of the system and ensure that the system met the user requirements, as well as to gather feedback for possible improvements. Based on the feedback, the respondents had commented on the system had met the user requirement but the user interface need to be made more 'eye-catching' for users. Performance testing was also undertaken, showing evidence that the system could handle a reasonable number of simultaneous users.

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