Presence of an Ecosystem: An Answer to ‘Why is Whole Greater than the Sum of its Parts’ in the Knowledge Building Process

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Abstract

The phenomenal success of certain crowdsourced online platforms, such as Wikipedia, is accredited to their ability to tap the crowd’s potential to collaboratively build knowledge. While it is well known that the crowd’s collective wisdom surpasses the cumulative individual expertise, little is understood on the dynamics of knowledge building in a crowdsourced environment. Our experiment shows that an important reason for the rapid knowledge building in such an environment is due to variance in expertise. A proper understanding of the dynamics of knowledge building in a crowdsourced environment would enable one in the better designing of wiki styled environments to solicit knowledge from the crowd. We use, as our test bed, a customized Crowdsourced Annotation System (CAS) which provides a group of users the facility to annotate a given document. Our results show the presence of different genres of proficiency which accelerate the process of knowledge building by the synergetic interaction amongst the users. We observe that the crowdsourced knowledge ecosystem comprises of four categories of contributors, namely: Probers, Solvers, Articulators and Explorers. We infer from our experiment that the knowledge garnering mainly happens due to the synergetic interaction across these categories.

Keywords: Collaboration, Crowdsourcing; Knowledge Building; Wiki.

Introduction

Over the last decade, Crowdsourcing has gained immense popularity in the area of learning and collaborative knowledge building, due to the ubiquity of the internet(Estelles-Arolas & Gonzalez-Ladron-de Guevara, 2012). The process and the mechanism of knowledge building has now progressed from being a scholarly pursuit of a single person to a decentralized collaborative endeavour of the many. The first attempt to create a knowledge repository dates back to 1st century AD, by a Roman author who attempted to create an exhaustive knowledge repository, came to be known today as the Natural History (Lindberg, 2010). There hasn’t been any significant improvement in the process of knowledge building from the ancient to the modern period. But, hitherto the advent of internet in the 1990s, the process of knowledge building has seen a breakthrough progress. In the recent past, there has been a considerable amount of effort towards developing appropriate platforms to help the knowledge building and learning process through crowdsourcing (Beldarrain, 2006; Bryant, 2006). Wikipedia, Quora and StackOverflow are good examples of such platforms. Wikipedia has perhaps evolved to be the best knowledge building experiment mankind has ever attempted in the past two millennia (Korfiatis, Poulos, & Bokos, 2006; Korfiatis et al., 2006; Wagner & Kong, 2006). Withstanding a whole lot of controversies and criticism, this open and free-for-all knowledge database stands tall in terms of its usage and reliability (Wagner & Kong, 2006) and has resulted in some of the proprietary encyclopedias go obsolete. Unlike Quora and Stack Overflow which are based on the discussion forum/ Q and A styled approach, Wikipedia is based on what is today called the wiki technology, allowing users to not only have access to its content but also enabling them to add/edit/correct the content online (Leuf & Cunningham, 2001; Raitman & Augar, 2005; Halatchliyski & Cress, 2014). An increasing number of communities benefit from using these crowdsourcing platforms in order to learn new things. While crowdsourcing based platforms are on an a rising scale in rapidly accumulating knowledge, thereby helping the users in learning various concepts (Howe, 2006), the dynamics of knowledge building and learning in such environments is relatively unexplored and not well understood. Understanding the behaviour and the type of interaction of users on knowledge building platforms is an important issue because it affects how we build such platforms in the future. The main contributions of our work are listed below:

- We present the framework of a portal which is based on combining the features of both annotations and discussion forums.
- Based on our analysis of the behaviour exhibited by the crowd, we present taxonomy of user behaviour on such portals.
- We present evidence that the reason for rapid knowledge building on such portals is the existence of ecosystem
among these categories and that the people in the crowd specialize in any one of these categories.

Finally, we propose a set of guidelines for the efficient design of portals, which may aid in the knowledge building and learning process.

Related Work

Knowledge Building and Learning

The idea of collaborative knowledge building was first proposed by Scardamalia and Bereiter (1994). Stahl (2000) presented a model for collaborative knowledge building which considers the relationship of processes associated with individual minds to those considered to be socio-cultural. Cress and Kimmerle (2008) proposed a theoretical model to describe the process of knowledge building in a wiki environment. Kimmerle, Moskaliuk, and Cress (2011) outlined theories related to individual processes of learning and collaborative processes of knowledge building. Zhang, Scardamalia, Lamon, Messina, and Reeve (2007) conducted experiments on fourth grade students to understand that young students can take collective responsibility for their own knowledge advancement through the use of online tools. Although, there have been several studies conducted, to understand what motivates the crowd to contribute in a crowdsourced knowledge building environment (Nov, 2007; Forte & Bruckman, 2008; Cress & Kimmerle, 2008), ours is the first study that explores the presence of variance of expertise in the crowd and its importance in catalysing the knowledge building process.

Interfaces for Learning

Hmelo-Silver and Barrows (2008) discussed about the need to create appropriate opportunities in order to support student learning and collective knowledge building. Vonderwell and Zachariah (2005) observed that online learner participation and patterns of participation are influenced by various factors such as technology, interface characteristics and student roles. Hence, there is a need to develop pedagogically user-friendly online course interface and management systems. On a similar line, Bederson (2004) presented various characteristics of flow within the context of interface design with the goal of understanding the type of interfaces that would be most conducive to the users. In online learning environment, the absence of an actual instructor necessitates an interface which could enable the students to understand the complex material in an easy way. Hence, the interface should be designed to maintain the users flow and to provide a better learning experience to its end users, thereby, increasing the social inclusion (Bederson, 2004).

Annotation Systems

The technique of discussion forums is the typically adopted means to gather knowledge from the crowd. Participation in discussion forums in online learning websites is linked to higher academic performance (Davies & Graff, 2005; Deslauriers, Schelew, & Wieman, 2011). It has also been found that discussions increase the engagement among students, thereby, leading to more learning (Palmer, Holt, & Bray, 2008). Nevertheless, discussion forums pose various limitations too. For example, they urge the user to leave the current document, browse another page and then re-join. This may disrupt the flow of reading of the user. Moreover, it might so happen that the user is lost in the vast sea of information available on those forums. The typical non-linear branching structure of online discussion forums may be insufficient for the realization of truly conversational modes of learning (Thomas, 2002). Many researchers have been working on improving the interface so as to achieve maximum benefits out of a crowdsourced platform. In order to eliminate the limitations of discussion forums, Guzdial and Turns (2000) defined a specific type of discussion forum which is a computer-mediated anchored discussion forum (CaMILE) with the potential to enable sustained on-topic discussions. The objective has been achieved by embedding hyperlinks from places of discussion into the HTML documents. Although, it is a considerable step towards improving the detached nature of discussion forums, it still requires the user to follow the link and redirects them to a different context. Cadiz, Gupta, and Grudin (2000) examined the benefits of in-context annotations. The authors conducted experiments on the members of a large development team using Microsoft Office 2000. Although, some annotation systems are already in place, which emphasize the advantages of in-place annotations, no significant work seems to be done in understanding the dynamics of knowledge building in a crowdsourced annotation environment. The initial work in the area of annotation systems includes work done by Marshall and Brush (2002). They designed WebAnn System which utilizes the advantages of in-place annotations by displaying the students annotations in the document margins. It allowed readers to see the document and the discussions on the same page. However, due to the fact that people were less comfortable reading online when WebAnn was developed, it was used by them merely as a record keeping tool. People used to read the document offline, mark the annotations and then get back to the system to register them. NB System (Zyto, Karger, Ackerman, & Mahajan, 2012) is theoretically similar to our system in the sense that it also provides the facility of in-place annotations. It is a web based tool where users can read and annotate PDF documents using standard web browsers. By the time NB was developed, people had become more technologically advanced and comfortable reading online. It further helped mitigating the obstructions that WebAnn faced. However, there was no discussion or experiments on annotators diverse expertise and their behaviour. Su, Yang, Hwang, and Zhang (2010) developed a Web 2.0 based collaborative annotation system, PAMS 2.0 (Personalized Annotation Management System 2.0) where the students can create and share individual annotations with annotated documents.
Taxonomy of Annotators Behaviour

In order to understand the dynamics of collaborative knowledge building, we created a web-based annotation system referred to as Crowdsourced Annotation System (CAS) where the annotations are attached to the corresponding text and are displayed in the document margins. Also, the margins provide a mechanism for the users to discuss amongst themselves after highlighting a particular chunk of text. Our experiment closely analysed the users’ behaviour when they were asked to annotate an article, thereby building knowledge. In characterising the predominant types of users in the crowd, we considered various types of annotations that the users posted onto the portal. Following are the main types of activities that annotators exhibit while collaborating on the portal (Activities such as voting, passive readers of annotations are not being considered here):

1. **Articulators**: The users who keep adding their insights about the particular text they are reading, and help in better understanding of the text, fall into this category. The annotations added by them are called I-Type Annotations.

2. **Probers**: The users who ask a lot of questions are called Probers. They might indicate a class of users who have less knowledge of the given text as well as people, who are in general inquisitive, and have this knack of asking good questions. The annotations added by them are called Q-Type Annotations.

3. **Solvers**: The users who answer the questions posted by others are called Solvers. As compared to the Articulators, who keep adding their knowledge even without having being asked any question, this type of users get into action only when they see a question. The annotations added by them are called A-Type Annotations.

4. **Explorers**: The users who do not restrict themselves only to the current resource, but also keep looking for some relevant information outside the given text, and make it available to everyone, go to Explorers category. The annotations added by them are called P-Type Annotations, where P indicates pointers.

We also separately define one more type of users:

5. **Voters**: The users who do not add any annotations, just read and up vote or down vote the annotations added by others.

Finally, there are users, who are passive users without taking any of the above mentioned roles.

6. **Viewers**: The users who only read the annotations added by others. Although these users make use of the portal in their own learning, they do not contribute in the knowledge building process on the portal.

The critical research questions that we pose and address in this study are:

**RQ #1**: Does a system which combines the features of discussion forums and annotations, help in the knowledge building process in a better way?

**RQ #2**: Do the people in the crowd just show a little behaviour from each of the categories identified or do they specialize in one of these categories?

**RQ #3**: How can the portal designers benefit from this knowledge of user behaviour?

The Annotation Experiment

Our experiment involved annotating an online document over a period of 4 days by 60 students on CAS\(^1\), where one could upload a document (henceforth called the main-article) and a group of users could be authorized to annotate the same. These users had to undergo a one-time sign up process before they could start annotating. Users could comment on the main-article and were allowed to see each others annotations. Any part of the document could be annotated by selecting the text that was to be annotated. A pop-up box then appeared, in which the users were asked to enter their annotations (see Figure 1). The annotated text of the main-article was shown highlighted on the interface. When the user clicked on this highlighted text, the corresponding annotations appeared on the right-side panel. Also, all the transaction logs were stored in a back-end database for analysis at a later point of time.

We classified annotations into four types, namely, [Q] question, [A] answer, [I] insight and [P] pointer. The users were asked to explicitly mention the type of annotation that they were going to add. They were provided with the option to reply on a [Q] type annotation with an [A] type annotation. They could up vote/down vote an annotation. The annotations in the annotations-panel were displayed in the decreasing order of the votes received, with the annotations with higher votes appearing on the top. This portal was available in the form of a light weight webpage, accessible over the internet.

Participants in our experiment were second year undergraduate computer science students from the Indian Institute of Technology Ropar, India in the age group of 19 to 21. The main-article that was uploaded was Randomized Closest Pair Problem which was part of their first course in data structures. This article was not covered in the classroom by the instructor of this course (who is also the fourth author of this paper) and was chosen carefully for this experiment for two reasons: (1) The article was less straightforward and was mathematically very involved, and (2) The authors felt that the students were less likely to understand the uploaded article by independent study. Also, the article was part of an advanced chapter from a reference book for this course (Kleinberg & Tardos, 2006).

**Observations**

Following are some of the important observations from our experiment\(^2\):

\(^1\) The Crowdsourced Annotation System (CAS) can be accessed at http://115.248.248.12/CrowdSourced/

\(^2\) Our analysis data has been kept open at the CAS portal.
Over a span of 4 days, 60 students posted 1828 annotations. Out of these, 444 were I-Type annotations, 339 Q-Type, 953 A-Type and 92 P-Type annotations. Also, there were 15932 reading entries, 811 voting entries and 66 watchers entries in the log. A Session is a group of interactions that take place on the website within a given time frame. For example, a single session can contain multiple screen or page views, events and social interactions. Also, Pageviews represent the total number of pages that users looked at, on the portal. There were a total of 875 sessions with an average session duration of 15.49 minutes and 3159 pageviews.

The first column in the table below indicates the annotation type, the second column is the percentage distribution, third, fourth and fifth columns represent the maximum, minimum and mean number of annotations of a particular type, taken over all the 60 users respectively. The last column indicates the standard deviation from the mean.

Table 1: Distribution, Max, Min, Mean and SD of Annotation Types

| Annotation Type | Percentage | Maximum | Minimum | Mean (M) | Standard Deviation (SD) |
|-----------------|------------|---------|---------|----------|-------------------------|
| I               | 24%        | 23      | 0       | 7        | 5.978                   |
| Q               | 19%        | 31      | 0       | 6        | 5.862                   |
| A               | 52%        | 71      | 0       | 16       | 12.831                  |
| P               | 5%         | 7       | 0       | 2        | 1.702                   |

Results and Discussions

From Table 1, we note that the [A] type annotations were more than half of the total number of annotations, which was 1828, this is due to the fact that a question triggers several back and forth exchange of ideas in the form of [A] type annotations. With just 5% of the total annotations, [P] type annotations were the least in number amongst the four types. This was still a very significant number, given that they were all links to external articles. With the main-article comprising of 250 lines, 92 [P] type annotations amount to an average of one pointer every 3 lines.

Analysis of User Contribution

At the outset, after taking note of the [I], [Q], [A] and [P] percentage distributions being 24%, 19%, 52% and 5% respectively, one would infer that most of the users mainly expended their time and effort in answering questions with [A] type annotations and secondarily on posting insights [I] and questions [Q]. This is quite in contrast to what was observed in our logs. The Figure 2 denotes the distribution of [I], [Q], [A] and [P] for individual user contribution of annotations, the x-axis denotes all the 60 users sorted in the increasing order of the number of annotations that they posted. There are 4 dots, colored blue, red, yellow and green, denoting the [I], [Q], [A] and [P] distributions respectively, of individual users. E.g., the 59th user (second last on the X-axis) contributed 68 annotations with [I]=20, [Q]=17, [A]=26 and [P]=5 amounting to the distribution (0.29, 0.25, 0.38, 0.08) which is denoted by 4 dots on the graph with x=59, namely blue: (59,0.29) red: (59,0.25) yellow: (59,0.38) green: (59,0.08). In simple terms, the graph below represents the distribution of efforts by individual users in posting 4 types of annotations. The [A] type annotations across all 60 users has M=16 and SD=13, this is well reflected in the plot below where we observe that the yellow dots are unevenly scattered and are not clustered along any line parallel to X-axis. This is true of red and blue dots as well.

In order to verify the efficacy of CAS, a web-based Feedback Form having 15 questions was prepared. Technology Acceptance Model (TAM) was used to prepare the questions (Fred, 1989). On an average, 82.69 percent students gave Strongly Agree or agree as their answers. The users also reported that the introduction of various types of annotations...
(i.e. I, Q, A, P) in CAS was useful in sharing the knowledge in the group. Also, displaying the annotations on the same page as the text was useful in bringing the students attention towards annotations added by others, which further enhanced their knowledge. Details of the assessment are given in the Appendix -I

**The Presence of an Ecosystem**

We call a user k-unispecialist if s/he appears in the list of top k contributors (in terms of number of annotations) for precisely one type of annotation, and doesn't appear in the top k of the other three types. E.g., a user A with the annotations [I]=7, [Q]=22, [A]=16, [P]=2 is ranked 26th, 2nd, 23rd and 14th in [I],[Q],[A], [P] respectively. Here, A is 2-unispecialist as s/he appears as one of the top 2 contributors in precisely one type and doesn't appear in the other 3 types. We note that, by definition, A is a k-unispecialist with k=3, 4... 13. We similarly define a k-bispecialist who appears in the list of top k contributors in precisely 2 types of annotations. E.g., the user A in the above example is a 14-bispecialist but not a 23-bispecialist. On the same lines, we define a k-Trispecialist and a k-Quadspecialist. The Figure 3 shows a plot of the number of k-unibi/tri/quad specialists with x-axis running through k = 1, 2, 3 ... 18. At k=10 (along the red dotted line) we observe that the number of 10-unispecialists, 10-bispecialists, 10-trispecialists and 10-quadspecialists are 24, 6, 0 and 1 respectively. The plot indicates that the top contributors are proficient in posting only a particular type of annotation. There are several unispecialists (blue line in the plot) and very few bispecialists (red line) and negligibly few trispecialists (green) and quadspecialists (purple). It is this ecosystem that exists in a crowdsourced environment that fosters knowledge building and guarantees both - quantity and quality of information. There are Explorers who are good at pointing to external resources which helps garner more data for the users; there are Solvers who are good at answering questions and Probers who ask questions which instigates the crowd to think outside the realms of the given article. Articulators with their above average ability for expressive writing, play a good role in paraphrasing parts of the document which are perceptively less clear to the readers.

Figure 4 shows the percentage distribution of the four types of categories at a certain value of K (K=13 here). This value of K has been randomly chosen. The other values of K (up to a threshold point) exhibit the same behaviour. We observe that when 13 top performers from all the four categories are taken together, then out of these, 73% of the users show expertise only in a particular category, i.e. they behave as unispecialists. Moreover, only 2% of all the users post annotations in all the four categories. The figure also shows the percentage distribution in other combination of categories. For example, only 8% of all the users added both I-Type and Q-type annotations. Only 8% added both I-Type and P-Type annotations. Only 5% added both A-Type and P-type annotations. And only 2% added both Q-type and A-Type annotations.

One can also observe that none of the annotators added in I, Q and P taken together, I, P and A taken together, and P, A and Q taken together respectively. Further, Only 2% added in I, Q and A categories taken together.

**A Model of User Behaviour**

We present a theoretical model of collaborative knowledge building with annotation systems by assuming a systemic perspective (Cress & Kimmerle, 2008). According to Luhmann, for the knowledge building and learning to take place, communication between the social system (the annotation system here) and the cognitive system (the annotators here) happens (Luhmann, 1995). We observe that the cognitive systems of the annotators externalize\(^3\) or internalize\(^4\) in order to

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\(^3\)Externalization is a process by which a user contributes to a knowledge building system.

\(^4\)Internalization is a process by which a user gains some knowledge from a knowledge system and adds it to his own Cognitive system(Cress & Kimmerle, 2008)
learn or add to the knowledge building respectively. Figure 5 illustrates the processes of Externalization and Internalization happening among the categories. Articulators, Probers, Solvers and Explorers post I, Q, A and P-type annotations respectively, through the process of Externalization. For example, the cognitive system of a Prober asks a question by externalising his question in the form of a Q-type of annotation to the system. This Q-type of annotation is perceived by the cognitive system of the Solver through the process of Internalization. And, in response, the solver externalizes the answer in the form of an A-Type of annotation, which is then internalized by the Prober. The figure also shows a chain of Ecosystem that exists among the categories. For example, the I-type of annotation of an Articulator prompts a Prober to ask a question through Q-type of annotation, which in turn provokes a Solver to externalize through A-type of annotation, seeing which the Explorer looks to the outside resources and adds a P-Type of annotation.

Figure 5: The rectangle represents the Annotation System. The Ovals represent the Cognitive Systems of the annotators. The Prober has been shown externalizing Q-type annotation to the system and internalizing A-Type annotation.

Pointers for Portal Designers

Although the main aim of this article is to understand the dynamics of knowledge building process, a part of our investigation can be useful for the portal designers in helping them prepare better interfaces for collaborative knowledge building in the following ways:

1. The annotation system suggests that if the information posted by the users is visible to everyone immediately, it is more likely that it will be seen by more number of users, and will hence enable better knowledge building and learning process.

2. The ecosystem in a knowledge building process might slightly vary, depending upon the mechanism used. It is important to identify the ecosystem of contributors and aid them to contribute better. E.g., enabling – at the interface level – a better display of questions to the “Solvers” Category would help them give their best.

3. In order to enable the ecosystem to flourish even more, the uni-specialists present in the crowd may be incentivized by making use of measures like votes and badges.

Conclusion and Future Work

In this work, we developed and executed an experiment involving text annotations by students in a web based environment. We report on an empirical evidence for the presence of an ecosystem of expertise in a crowdsourced environment. Our experiment shows that the ecosystem comprised of four types of people: Articulators, Probers, Solvers and Explorers who were good at providing insights, asking questions, posting answers and pointing to external resources respectively. We observed that the top contributors specialised in a single task, and further noted that the knowledge building process in a collaborative environment is triggered and fostered by the rapid back and forth exchange of information between the top contributors, who are - as we term - the unispecialists. While it is commonsensical to observe “more the merrier” holding good in a crowdsourced environment, it takes a detailed experimental investigation to establish the fact that the very reason why “Whole is greater than parts” is due to the distribution of expertise in the crowd. It would be interesting to further investigate on the exact distribution of the expertise in large crowdsourced environments. We envision that the collaborative knowledge building environments in the future will be designed taking note of the presence of ‘diversity of expertise which is a great catalyst for knowledge building. In the near future, the authors plan to conduct a longitudinal investigation on CAS for a few months. This may prevent the biases drawn from a limited time span of the experiment, if any. Based on the statistics thus obtained, more qualitative investigation can be performed, the interaction among the annotators can be better analyzed and the categories can be reformed, if required.

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Appendix-I

User Assessment of CAS

Emerging information technology cannot be effective if it is not accepted and used by potential users. At the end of the session, the students were asked to provide their feedback about CAS through a web-based form. The form used Technology Acceptance Model (TAM) to explore the ‘Perceived Usefulness’ and ‘Perceived Ease of Use’ of CAS. TAM is one of the most successful models to assess the user acceptance of emerging information technology among practitioners and academicians. The model attempts not only for prediction but also for explanation to help researchers and practitioners identify why a particular system may be unacceptable and pursue appropriate steps. Two particular beliefs are addressed through TAM: Perceived usefulness (PU) and Perceived ease of use (PEOU). Perceived usefulness (PU) tells prospective users subjective probability that using a specific application system will increase his or her job performance within an organizational context. Perceived ease of use (PEOU) tells the degree to which the prospective user expects the target system to be free of effort.

The universal efficacy of CAS was also established in the feedback from the participants. They reported that the introduction of various types of annotations (i.e. I, Q, A, P) in CAS was useful in sharing the knowledge in the group. Displaying the annotations on the same page as the text was useful in bringing the students attention towards annotations added by others, which further enhanced their knowledge. Apart from these the dimensions PU and PEOU, the questions were asked on one more dimension named Satisfaction (SAT), to measure the degree of contentment among the participants. The Feedback Form included fifteen questions using a five-point Likert scale (strongly agree; agree; undecided; disagree; strongly disagree). The questions were classified as: (1) PU (7 Questions); (2) PEOU (5 Questions); (3) SAT (3 Questions). Out of 64 participants, 52 had filled the form. On a scale assigning the values as: 5 for ‘Strongly agree’, 4 for ‘Agree’, 3 for ‘Undecided’, 2 for ‘Disagree’ and 1 for ‘Strongly Disagree’, the participants reported on a mean in the range of 3.12 and 4.25 for all the fifteen questions. Following are the 15 questions asked in the assessment:

1. I think the introduction of various types of annotations (i.e. I, Q, A, P) in CAS was useful in sharing the knowledge in the group.
2. I think with the use of CAS, I was able to understand the given text in less time.
3. I think displaying the annotations on the same page as the text was useful in bringing the students attention towards annotations added by others.
4. I think CAS was helpful in exchanging my thoughts across others, while reading.
5. I think I have been able to understand the text in a better way through the use of CAS, as compared to what I would have done, without the use of such an interface.
6. I think that voting of annotations was useful in scrutinizing high quality annotations out of all the annotations.
7. I think such an annotation system is more useful than a simple discussion forum.
8. I think it was easy to add a new annotation to the text.
9. I think it was easy to view the annotations added by others in the right panel.
10. I think it was easy for me to understand how to use CAS.
11. I think the Graphical Interface was quite easy to work with.
12. I think due to the introduction of various categories of annotations, it was easy for me to put across my point on the interface.
13. I am thoroughly satisfied with use of CAS for reading an article.
14. I would like to use this interface for reading other texts also.
15. I would like to use this interface in future.

Figure 6 shows the distribution of various responses of the 15 questions by all the 52 students.

![Figure 6: Distribution of Responses](image)

On an average, 82.69 percent students gave ‘Strongly Agree’ or ‘Agree’ as their answers. We also analysed the suggestions/comments that the students were asked to fill, along with the ratings. Following are some of the comments:

The idea of having such a system is great, and CAS was good.
CAS is very good source to understand texts in a better way. It was user friendly and very useful for understanding while reading the article.
I would like to test this on further topics.
Overall it was a good learning platform where you can easily share your understandings with other people in the group, ask questions when required and get the answers and point of view of other people. It is a good tool to assess and evaluate your understanding of the concept.
CAS is very good source to understand texts in a better way.
The idea of having such a system is great, and CAS was good through this, learning was very easy and quick and also enjoyable.
Everything is really good..be it the user-interface or the whole concept of IT.. Infact.(sic) I with some of my intellectual friends seriously want to study through this medium where exchange of ideas is so easy.
The CAS system was good enough to learn /analyse the text
in less time.
The site was perfectly built and was very useful to fully understand the topic.