Managing Information Overload in Distributed Computing Environment

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ABSTRACT

The rapid growth and improved accessibility to Internet has presented users with huge amount and variety of information. From communication programs for instant messaging and email, the technology is now become powerful and reliable to support freely networked business relationships. However, the web is causing information overload and it is becoming difficult to focus on specific information. People are unable to attend the huge volume of information presented to them.

The paper provides a review of nature and causes of information overload and explores various solutions to the problem. In this paper, we have identified various sources of information which may cause information overload problem to a user in distributed computing environment. We also suggest techniques to measure the amount of information overload in specific situations. Finally, we have presented the method of using the information effectively for making business decisions.

KEYWORDS

Information Overload, Cognitive Load Theory, Search Interface

INTRODUCTION

Internet and the World Wide Web have presented users with huge amount of information. While tools for conducting business, communication and sharing information electronically have enabled companies to transact practically at the speed of light, they have also radically changed the way of conducting business. From communication programs for instant messaging and email to middleware and Linux, the technology is finally powerful and consistent to support freely networked business partnerships. The extended enterprises have ability to increase responsiveness by imposing performance constraints.

Information is necessary for decision making and thereby reducing uncertainty. But when the availability of information is greater than requirement, the user has to spent more time on understanding, and the decision making process is delayed. On the Internet the major issue is locating the resources of high quality in the ocean of WWW. With the exponential increase of information, the concurrent development of search engines and resource discovery tools is necessary to tap the valuable information available on the net. When the information is stored manually in paper documents, its retrieval on some future date was very difficult. With arrival of web, it became possible to store the information on-line. But the main problem is that, so much material is available online and volume of information is so much that it can not be accessed by the individual on time.

Internet is like a virtual library spread over more than hundred countries and three hundred million people. Computer and Internet has caused information explosion and most of the information is produced within last three decades. People have to face large volume of information which they are unable to attend. Various sources of Information are newspaper, television channels, magazines, Internet Web sites etc. WWW has crossed one billion web pages with two million web pages being added daily on the web. Machine generated data from variety of sources is increasing at an exponential rate and could hit 1000GB per person per year by the year 2015. The technology is causing information overload and it is becoming difficult to focus on some specific information. Getting access to data, determining its accuracy and quality and then knowing how to make good decision with the data across an extended enterprise is becoming difficult [4,11]. Figure 1 depicts a large number of information sources eventually leading to information overload.

Initial benefits from search engine technology have been critically degraded over time by rapid increase in the number of Internet pages. Traditional retrieval strategies, therefore, yield poor results. Search engine users are increasingly experiencing information overload. Information overload has affected business productivity of an organization as well as work performance of individuals [1,2,5]. Technical approaches to dealing with this problem have caused initial euphoria, yet have proved ineffective in solving the problem. Enhancement of user empowerment in the area of Internet based information retrieval must therefore focus on augmenting user capabilities. Issues of information literacy and information anxiety are explored relevant to non-professional users [3,12].

MEASUREMENT OF INFORMATION

Information can be measured using cognitive load theory (CLT). Cognitive load is a term that refers to the load on working memory during instruction.
CLT provides guideline to assist the presentation of information such that it improves learning process. It implies aspects of information on processing theory for optimizing intellectual performance. CLT can be used to understand how instruction manuals can be better designed in the area of electronic equipments, computers and machines. It can also be applied to understand complexity of search software and search interfaces. Various types of cognitive load include[8]:

a) **Intrinsic cognitive load**: The complexity of a learning task is called intrinsic load. Complexity of a learning task and any learning material both affect the user ability to gain the knowledge [8]. All the instructions have inherent difficulty associated with them that can not be reduced e.g. addition operation and calculating inverse of a matrix have different difficulty levels. However a complex problem may be broken into sub problems. Each of these sub problems can be solved independently and can be finally combined together to give overall solution to the main problem. E.g. to find inverse of a matrix the sub problems are finding the adjoint, determinant and transpose, each of which has a lower difficulty level as compared to finding the inverse of a matrix. These sub problems can be solved independently and results can be combined.

b) **Extraneous cognitive load**: Learning material to support user learning is called extraneous load. It refers to the way of presenting the information to the user that is developed by instructional designers. The load refers to the design of instruction material. E.g. information represented in pictorial form can be easily grasped than textual form (Common saying “picture is worth a thousand words”).

c) **Germane load**: Germane load is required to commit any thing into long term memory. Instruction designers should limit extraneous load and promote germane load for enhanced learning.

**MANAGING INFORMATION OVERLOAD**

In the following paragraphs some techniques of solving information overload problems are being suggested [6,7,9,13]:

- **Using Efficient Data Retrieval Techniques**: To reduce the information overload, innovative information retrieval technologies are necessary. Information overload can be reduced by efficient data retrieval and information gathering tools, database and data mining techniques. However, the ability to understand and analyze information also important factors in facing the information overload.

- **Using Intelligent software solutions**: Intelligent software solutions are necessary for computing information overload. “Interface agents” are the programs to employ AI techniques to provide assistance to the users. They will reduce the work load and enable users to work on complex application by providing assistance. E.g. Maxims is an email agent developed by MIT for prioritizing, deleting, forwarding, sorting and archiving email messages on behalf of users.

- **Providing Efficient Technology Tools to Managers to Improve Search**: Managers are bombarded with information and struggling to collect, track and find the useful information using proper tool. To solve the problem of information overload, technology will play a key role in analyzing multi-dimensional factor, track research and integrate varied data in the workflow. The tools should be able to make the research process more efficient and cost effective. E.g. tools for configuring emails and blocking automatically if they are not useful. These tools...
should allow accessing, filtering, analyzing and comparing data. [10]

- **Reducing the Complexity in Search Interfaces:** The search interfaces should not add complexity or information overload. Enriched functionality and clarity in design are the two opposing forces. Proper interface design can minimize the information overload e.g. dedicating screen space to unused facets or showing defaults of most popular values. Functional benefits of one browser over other come at a cost of interface complexity of the user. According to cognitive load theory (CLT), complexity of a learning task and any learning material both affect the user ability to gain the knowledge they seek. This complexity of a learning task is called intrinsic load [8].

**CONCLUSION**

Information overload is stumbling block in translation of information into knowledge. This paper provides a review of nature and causes of information overload and explores various solutions to the problem. Information is increasing exponentially through various sources and causes information overload problem to a user in distributed computing environment. Cognitive load theory can be useful in measuring the information. Managing information overload can be through efficient data retrieval techniques, using intelligent software solutions, providing efficient technology tools to managers and improve search, reducing the complexity in search interfaces etc.

**FUTURE SCOPE**

In the current paper we have given an idea of measuring information and brief review of techniques to measure information. In our future research work we propose to develop the model for quantitatively measuring information overload and develop to manage information overload problem.

**REFERENCES**


