DSS Access on the World Wide Web: An Empirical Test of an Open DSS Protocol

Dawn G. Gregg: dawn.gregg@asu.edu
Michael Goul: mike.goul@asu.edu
Andy Philippakis: philippakis@asu.edu
School of Accountancy and Information Management,
College of Business,
Arizona State University,
Tempe, AZ 85287-3606

Abstract

The World Wide Web (WWW) was designed to be a "pool of human knowledge, which would allow collaborators to share their ideas and all aspects of a common project" [1]. This goal for the WWW makes it an ideal distribution system for the Decision Support Systems (DSSs) of the future. The purpose of this research study is to validate a protocol that was designed to allow DSS information to be found and transmitted via the WWW. This paper describes an empirical study designed to determine if users can utilize an Open DSS protocol to create specifications which fully describe specific DSS applications. The results of this study will be presented at the conference.

Introduction and Background

At present the Internet provides access to hundreds of gigabytes of software, documents, sounds, images, and many other types of information [5]. It is only a matter of time before vendors begin deploying Decision Support Systems (DSSs) on the WWW on this type of scale. An initial Open DSS protocol has been developed. This protocol allows users to easily discover and use specific DSSs either on the WWW or on their home or organization computer. The purpose of this phase of the research will be to validate this Open DSS protocol by determining if new protocol users can utilize it to create specifications which fully describe specific DSS applications. The specifications should describe the DSS clearly enough that autonomous intelligent search agents could be used to determine if the DSS described meets specific user defined criteria.

Four recent papers have examined the how DSSs could be deployed on the WWW. These papers, by Bhargava et al. [2,3,4], present DecisionNet, a prototype of a brokered system that facilitates transactions between providers and consumers of decision technologies. Under this system, all DSS developers must submit their DSS for inclusion in the DecisionNet system and all DSS users must register in order to use DSSs from their system. This approach greatly simplifies the deployment of DSS on the WWW. For example, registered DecisionNet subscribers do not have to download the DSSs they want to use. Instead they access the DSSs remotely and run them on the host computer. This allows users to utilize a DSS even if they do not have the hardware or software necessary to run it.

The fourth paper's approach for DSS deployment is an open-system that would allow DSSs to be distributed on individual web pages, consistent with the way other types of data are currently being offered. Goul et al. [6] propose a set of requirements for a protocol suite that will allow the deployment of Open-DSSs on the WWW. A protocol based on these requirements would utilize specialized WWW search agents (e.g., Robots, Spiders, and Wanderers) to provide automated intelligent discovery of DSSs pertaining to a specific decision making or problem solving situation. The advantage of an open protocol is that the automated intelligent search agents would have the capability of finding any DSS (compliant with the protocol), not just ones posted with an individual broker. However, the open system has no mechanism to control what is put on the Internet and portrayed as a DSS [6].

The DSS protocol being validated in this study is an open protocol, capable of indexing both individual DSSs as well as those offered by a brokered system. The Open-DSS Protocol is a general protocol that provides facilitated access to DSS on the top of existing Internet application layer protocols. It consists of four layers, the Metainformation Layer, the Specification Layer, the Transaction Layer and the DSS layer.

The first layer in the Open-DSS protocol, the Metainformation Layer, represents an extension of HTTP. It utilizes a set of specialized headers to provide basic information about the DSS to the automated intelligent search agents. The header information must be in a consistent format so that the automated DSS search agents can index the Web pages correctly. The basic information necessary for DSS headers includes the content-type (DSS), the DSS type, the hardware platform the DSS is designed to run on, the price of the DSS, a list of keywords, and a description of the DSS.

The next layer is the Specification Layer, which contains all of the information necessary to completely explain the DSS. The specification will define the functionality of the DSS being offered, the user-site requirements and other information necessary to evaluate the DSS. The type of information that should be included in the specification of the DSS's functionality includes the problem domain of the DSS, the solution options, the inputs, the outputs and assumptions made. The information on the resources to be provided by the user should include information on the hardware requirements (e.g., computing platform), software requirements (e.g., operating system or application needs), and any specific user skills required to use the DSS. Finally, the specification must contain all

other information necessary to purchase and download the DSS. This would include information on the DSS's cost, its references, related DSSs, and vendor information.

The third layer is the Transaction Processing Layer. This Layer is responsible for any transactions that are necessary before the software will be made available to the client. The final layer is the DSS Layer. This layer contains the DSS executable and any instruction manuals. A complete description of the proposed protocol can be found at http://www.public.asu.edu/~dgregg/dss_protocol/dssprotocol.html.

Purpose of the Study

The purpose of this research study is to validate and develop an Open DSS protocol to determine if new users of the protocol can easily utilize it to create specifications which fully describe specific DSS applications. More specifically, this research will:

1. validate the rules for defining DSS Web pages contained in the Metainformation and Specification Layers of the protocol
2. generate additional rules for the protocol, based on a set of test implementations; and
3. obtain feedback on how the protocol will need extending to allow autonomous intelligent search agents to identify DSSs which meet specific user defined criteria.

Scope and Limitations of the Problem

This research project will utilize student subjects. All subjects will be masters of information management students in the college of business at a large university in the southwestern US. All subjects will be enrolled in a decision support systems course at the time they are asked to participate in this study. The primary limitation to this study is that students are not currently DSS designers and may be unaware of all of the details/capabilities of the DSSs they choose to describe.

Methodology

The primary objective of this study was to determine the comprehensibility of the protocol and to obtain feedback on how easy the protocol was to implement for a variety of DSS applications. To meet this objective the student subjects were asked to complete the following tasks:

1. They were divided into 17 groups of 1-4 students and were asked to design a specific DSS.
2. They were then provided with a description of the specification variables contained in the proposed protocol and asked to create a protocol compliant specification for their DSS application (completed individually).
3. Once the students complete their protocol specification they were given a another student's protocol specification and were asked how applicable their DSS and the other students DSS were for a set of 10 business cases. The business cases were targeted at the two DSS being reviewed.
4. The students then answer questions aimed at gathering information about: the specification creation process, the completeness of the specification, and the clarity of the specification.

The student subjects responses for the specifications, cases and questionnaires are currently being evaluated to:

1. Gauge the success of subjects in performing their task. Success is based on the usability of the specifications. (Syntactical correctness, Accuracy and Completeness (of DSS description), Pertinence, Appearance, and Readability, (visibility and comprehensibility)) [7].
2. Compare answers to case scenarios to determine the difference in the answers for the student DSS creators and the student DSS evaluators.
3. Determine the effort involved in accomplishing the task (time spent).
4. Establish the factors that are likely to influence the success or effort. These factors include students' experience and DSS type being described.
5. Capture subjects perceptions about the protocol.
6. Obtain feedback on improvements that can be made to the protocol.

For each objective, measurable indicators were identified. Responses and objectives will be weighted so that a total measure of protocol utility can be determined [8]. The results of this analysis will be presented at the conference.

Further Research

The results of this study should allow us to determine to what extent new protocol users can utilize the protocol to develop compliant Web pages. These pages should be easily distinguishable from other types of Web pages and should be able to be read by autonomous intelligent search agents to determine if the DSS described meets specific user defined criteria. If results indicate the protocol is useful, the protocol development process will be continued. The next step in this process will require the development of an autonomous WWW search agent. This search agent will identify and index the protocol compliant Web pages produced by the student subjects. Then an end-user search tool which allows appropriate DSSs to be identified will be developed and validated.

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