Payoff

The World Wide Web's potential as a strategic information tool is limited by the time, costs, and frustration associated with Web use. Intelligent agents that facilitate searching, monitor information changes, and customize and order information according to individual needs help managers reduce information overload and more effectively use the wealth of information available on the Web.

Introduction

Organizations that invest much time and effort in information systems that support unique management needs are increasingly integrating the World Wide Web (Web) into their IS portfolio. Although countless articles have espoused the Web's promise to provide information and commercial opportunities to the business community, several current limitations make the Web fall short of expectations.

Recently, intelligent agents have become practical solutions for addressing these limitations. The use of intelligent agents is important for Web developers, IS and business managers, and organizations interested in maximizing the benefits of the Web as an information tool while minimizing the time, costs, and frustration associated with Web use. After describing how the Web nominally supports management information needs, this article illustrates how five types of intelligent agents address the current Web weaknesses managers may encounter.

Web-Supported Information Needs

Managers are unique systems users because of the wide variety of tasks they perform, the diversity of information they require, and the dynamic nature of their decision-making environment. The literature on executive information systems, for example, illustrates that executives require special systems that:

- Are custom tailored to individual executives.
- Extract, filter, compress, and track critical data.
- Access and integrate a broad range of internal and external data.
- Are user friendly and require minimal or no training.
- Are used directly by executives without intermediaries.
- Present graphical, tabular, and textual information.

Over the years, systems have evolved to address these requirements and provide executives with effective tools for accomplishing management tasks. The Web appears to
be yet another innovative way to address such needs. A broad range of internal and external data is accessible from Web sites within an organization and from external sites located around the world. Managers can use the available graphical packages to navigate the Web without assistance. Web browsers also present information in creative ways, taking advantage of graphics, sound, and video.

**Limitations of the World Wide Web**

Information overload, constant updating and reshuffling of information, and minimal support for novice users are some of the current problems that reduce the Web's value to managers. The lack of Web regulation and control combined with rapid growth have contributed to an abundance of information. Because this information changes constantly with little order or customization, it is difficult for managers to locate information efficiently, especially because they typically navigate this chaos with minimal or basic computer skills. As managers increase their Web use, organizations will become more concerned about these problems.

**Capabilities of Intelligent Agents**

Intelligent agents (agents), also called software agents, are software programs that help find, organize, and present information that is custom tailored to meet a manager's needs. The programs are relatively autonomous; they are not attached to a particular software application and do not need a user for activation. Agents always are ready to perform a specified action according to preset user parameters. In addition, advanced agents learn trends and user preferences, and they can analyze information to support decision making.

Agents address a variety of problems. They are designed to save time, perform mundane tasks, fulfill requests tailored to specific needs, and manage data. To some people, these agents serve as personal data assistants, addressing diverse information requirements. But, unlike a human assistant who needs sleep and occasional days off, an agent addresses customized needs around the clock.

There are many types of agents, and a multitude of classification schemes have been suggested to help understand what intelligent agents can do. In general, agents vary in terms of three dimensions: agency, mobility, and intelligence. These dimensions respectively refer to the autonomy of the agent's performance, the amount an agent traverses through networks, and how much an agent can learn or adapt to user requests. Agents can perform several functions, including:

- Weeding out unnecessary data.
- Alerting to specific conditions.
- Matching requesters with requests, while maximizing resources.
- Routing, creating, updating, and destroying data.
- Identifying trends and combining information from different sources.
- Performing administrative functions.
Some examples of agents include those for filtering E-mail, scheduling appointments, locating information, making travel arrangements, and paying bills. It has been suggested that agents will someday perform the tasks of a knowledge worker throughout the day, making human executive assistants unnecessary.

**Using Web Agents to Meet Management Needs**

The World Wide Web has five primary shortcomings:

- Too much information.
- Changing information.
- Unordered information.
- Lack of support for novice users.
- Minimal customization.

The increasing use of agents on the Web has resulted in a growing number of creative and helpful agent solutions that address these shortcomings. The following sections present five types of Web agents—search engine, monitor, publisher, guide, and personal assistant—each of which addresses a major Web shortcoming and supports several management needs.

**Using Search Engines to Reduce Information Overload**

The ease of creating Web pages has triggered the proliferation of Web pages representing users, organizations, and topical issues. Burgeoning numbers of new companies providing skills and services promote further production of Web pages. Unfortunately, the proliferation of data available on the Web makes it difficult for managers to find useful information.

To address this problem, intelligent agents called search engines seek information and present results based on prespecified criteria. Search engines extract, filter, and compress critical data from a broad range of internal and external sources. Most search engines have similar interfaces in which a manager enters some criteria (e.g.,\( subject = stock \text{ market} \) \( AND \) \( date=1996 \)). After the search is invoked, a list of Web page addresses are displayed for further investigation. Some search engines provide options that set a time limit for the search, the number of addresses to be displayed at one time, and the amount of detail to include in the output.

One search engine, SavvySearch, is considered a metasearch tool that provides a convenient interface, available in multiple languages, to several other search engines.\(^{129}\) The manager enters criteria for a search and selects options that expand or limit the search output. This metasearcher ranks a list of available search engines (e.g., Alta Vista, Lycos, and Yahoo)\(^{130}\) and transfers the search request to selected engines. The selection is based on the query, topic area (e.g., Web resources, news, or entertainment), estimated Web

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\(^{129}\) http://www.cs.colostate.edu/~dreiling/smartform.html.

traffic, anticipated response time of the other search engines, and the load on the SavvySearch computer.

Using Monitors to Keep Up with Changing Information

Not only is there an abundance of information on the Web, the information is changing constantly. Many Web pages contain information that is regularly added to, deleted, or modified. The location of these Web pages changes as well; servers, directories, and file names move and disappear, frustrating managers who reference invalid links.

Monitor agents accommodate the problems created by dynamic information. These agents let managers track critical data by looking for changes on the Web and communicating these changes to the manager. Instead of relying on people to determine when information becomes obsolete, a manager can count on monitor agents to flush out changes as information evolves and provide direct notification of them.

Both Specter Communications and First Floor Software offer agents that search the Web for updates on selected sites. WebWatch from Specter Communications, for example, checks selected sites automatically and highlights modifications. A manager can have WebWatch monitor competitor sites for market changes, for instance. Managers who use WebWatch can view downloaded Web sites offline at their convenience. WebWatch has filtering capabilities similar to search engines that allow the agent to traverse the Web looking for changed Web sites, while the program resides on a personal workstation and updates Web bookmarks (i.e., listings of Web site addresses). Such an agent helps managers keep pace with the ever-changing business world.

Using Publishers to Make Sense of Unordered Information

Information on the Web is unordered, redundant, and uncategorized. Unlike a library, which offers a well-defined process for searching for information, the Web offers no standard approach for meeting information needs. Therefore, intelligent agents that custom tailor information to individual executives while accessing and integrating a broad range of internal and external data are highly desirable.

Publisher agents do just that. Although they have access to large amounts of information, they present to a manager only the topics and types of information that have been prespecified, often in a variety of presentation formats.

For example, PointCast Network (PCN) provides a personalized newspaper to users of the software. First, managers select the topics that they want to read about. This could include headline news, stock quotes, weather, sports, or industry and company news. Based on a manager’s interests, hundreds of articles are filtered, integrated, and “pointcasted” to the manager to read at his or her convenience. The text is accompanied by weather and stock price quotes presented graphically in maps and charts.

Using Guides to Maneuver Novice Users through the Web

Users can access the Web with a Web connection and basic computer skills. Browsers, such as Netscape and Mosaic, take advantage of Windows’ point and click environment and graphical interface to further facilitate Web use. With ease comes the surge of novice

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users, including managers, rushing to encounter the global electronic network. This results in the continual need to maintain ease of use.

Some software agents on the Web, called guides, learn user habits and preferences and adapt to individual needs. This is beneficial for managers who are Web novices, because an adaptive and easy-to-use interface requires minimal training and can be used directly by the manager without an intermediary. The more managers can rely on guides to lead Web experiences, the more time they have to focus on the content and significance of information they encounter.

ZooWorks from Hitachi is a guide that remembers and sorts each Web site that a manager views.133 This information is placed in a personal index for future access. The index organizes and structures Web viewing and provides an easy way to locate past sites by keywords, a date, or a range of dates. Because it manages Web information more effectively, ZooWorks helps managers spend their time using information rather than searching for it.

Using Personal Assistants to Customize Web Information

Diverse visitors stop by organizational Web sites, and different types of people peruse individual Web pages. Because there are myriad purposes for visiting a Web site, a Web page needs to be flexible enough to change to serve each purpose. A financial manager of a company, for example, would be interested in different information than a marketing manager.

When managers locate pages of interest, the information needs to be presented in a useful, understandable way. Personal assistants help present tabular, textual, and graphical information that has been custom-tailored to manager needs. Agents such as BroadVision, Inc.’s One-To-One product work to make Web pages more relevant to individual users by customizing them based on a user's demographics and usage patterns.134 Instead of viewing static, general information, managers can interact with personalized Web pages that have been customized through a learning process. For example, a financial manager may see stock quotes and links to financial news articles when entering the company Web site; whereas a marketing manager may be linked to sales information and recent promotions.

Limitations of Web Agents

Although Web agents add great value to the growing number of managerial Web experiences, they do have some limitations. First, agents can be resource intensive; they often must be monitored and their activity needs to be harnessed. If an agent makes a large number of requests in a short amount of time, servers may slow down to a crawl or crash. Some Web servers opt to boycott agent activity and technically prevent agents from interaction. Agents that reside on user machines must be updated and regularly maintained to ensure continued usefulness. In addition, although search engines provide a good starting point for locating information, general searches can result in too much or irrelevant information. Without the proper intervention, agents used to reduce information overload can aggravate the problem.

133 http://www.zoosoft.com/
Conclusion

Managers who increasingly use the Web to support their information needs can use the searching, monitoring, and customizing capabilities of intelligent agents to address Web limitations. By custom-tailoring information to individual executives; extracting, filtering, compressing, and tracking critical data; and accessing and integrating a broad range of internal and external data, these software programs help support basic management information needs.

As intelligent agents mature, their minor limitations will be overcome. In the future, as organizations integrate the Web into their technology plans, they will have to increasingly rely on intelligent agents to ensure effective Web use.

Bibliography


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