Webcasting/Push Technology on Intranets and Extranets

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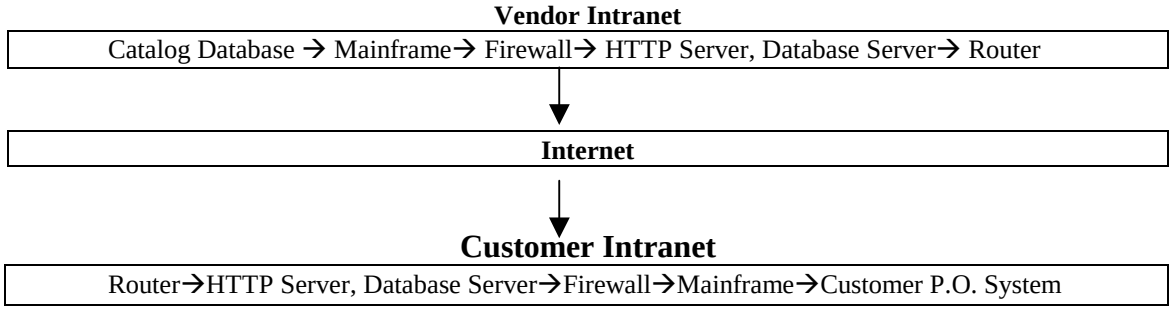
Abstract

Webcasting or push technology automatically sends information from the producer of information to the server or client computer of the subscriber. This paradigm is different from the traditional method of accessing Web content where an individual would seek out information via a search engine or URL. Webcasting does not require active participation by the viewer and in this sense it is more like the television mode of information delivery. However, unlike TV broadcast, different information may be "webcasted" to different receivers as indicated by their idiosyncratic needs. This paper briefly reviews the evolution of webcasting, discusses its implications for management or marketing decision makers and offers a methodology that managers can use to evaluate and select a webcasting technology and software for information delivery over the intranet/extranet for better decision making.

1. Introduction

Push technology or webcasting automatically pushes information to the client desktop if the client computer has client software from a push technology vendor. Push technology is useful for providing information over the Internet, Intranets, and Extranets (Andrews 1997; Desmond, 1997; Grunin 1997; Stanek, 1997; Ubois, 1997). Extranets have become more important recently as intranets are joined together across the Internet (Haskin 1997; Nangle 1998; Maloff 1997). This makes it possible to share information across multiple intranets and improves the productivity of manufacturers, their suppliers, dealers and customers. Customers benefit directly by being linked to a company's extranet, for example, a FedEx customer is able to track the shipment of his package over the Internet by accessing the FedEx website. Extranets let businesses use standard Internet technology to set up secure data communication over the public Internet. An extranet is essentially a WAN that runs on public protocols. The components of an extranet include network access, servers, business applications, and interface software (Maloff, 1997). Extranets extend the potential benefits of webcasting for individuals and organizations since they link organizations with their suppliers, dealers, and customers. Figure 1 presents an extranet that connects a vendor's intranet with its customers (Nangle, 1998).

Figure 1: An Extranet Connecting a Vendor With its Customers



The components of an extranet are defined as:

1. Network Access: Internet connectivity is required among all participants.

2. Servers: Compatibility with industry standards must be maintained at the operating system level, HTTP server, and database server levels.

3. Business applications: These applications allow people to communicate, exchange files, purchase goods, conduct information searches, etc. Groupware are also quite useful for collaborating on projects across business enterprises and extranets. For example, Lotus Notes and Netscape Communicator are useful for this purpose.

4. Interface Software: Effective extranet interfaces address four different interaction scenarios: individual, one-to-many, two-way, and many-to-many interactions. Web software allows multiple users to access the same system and get different information on the fly through HTML pages, databases, and other applications.

Push technology has rapidly gained considerable popularity since its emergence in April 1996 when PointCast Corporation announced its PointCast Network that soon became very popular (Hassett and the PointCast Team 1996). It pushes selected news and stock quotes into a user's machine at prescribed intervals. Since then, a number of similar solutions have been proposed and deployed on the Internet. PointCast software has also evolved over time to offer software for intranets and extranets (King, 1997). Push is also known as "webcasting", "netcasting" or "PointCasting" (after the company that invented it). When applied appropriately, it can be used to solve real business problems. PointCast was recently acquired by Infogate Corporation (infogate.com) and is now available from its website.

This paper discusses webcasting or push technology, and proposes a framework for building a decision support system to help MIS managers evaluate and select the most appropriate webcasting tool to deliver information over the intranet/extranet. This paper is organized as follow. Section 2 defines push technology, section 3 presents two dominant push technology frameworks, and section 4 discusses push technology applications for management and marketing decision-making. Section 5 proposes a DSS framework for helping managers to evaluate and select the appropriate push technology tool to deliver appropriate and timely information over the intranet/extranet.

2. Push Technology Defined

Push technology is a technology by which a program running on the client's workstation can either request or receive information from Web automatically (on a pre-arranged schedule or when certain events occur) and then display that information on the screen of the client's terminal. Content is delivered through a variety of ways, mainly through a browser either built-in to the push client or captured by an external browser like Netscape. One possible method delivers content right to the user's e-mail client. The program running on the workstation can be called the push client. Push clients are only one side of a client/server process. On the other side of this process, push servers are responsible for sending channels of information to clients. A channel is a pre-selected Web site. The availability of various channels depends on the push client software. The content of a channel can be personalized so that the user gets only the self-selected information. Many current push systems make use of user profiles to better determine what information a particular user actually wants to see. There are many different filtering technologies in use on the Web today. A push content provider may be an organization that creates an intranet or extranet, like Ford Corporation, or it may be push technology software company like Infogate Corporation (previously PointCast Corporation) that serves as an information aggregator that pushes information to the client desktops (Keyes, 1997; Kirk, Negus and Weiss, 1997; Kosiur, 1997; Lindsky 1997).

Many of the so-called push technology solutions are actually "smart-pull" services requiring clients to automatically request information through search requests to servers. "Smart-pull" depends on the server that records user preferences. The true push technology is the unscheduled delivery of information to an end user. Even though push applications are not really push, there is a difference among them. The difference is the automation of the process for both the publisher and the subscriber. There are a couple of true push technology applications, e.g. products like AirMedia Live and Wayfarer (INCISA).

3. Dominant Push Frameworks

There are two major types of push technology models: (1) Blanket Push, and (2) Publish and Subscribe. Blanket Push involves client software provided by push technology vendors. The client software resides within the intranet firewall while the server software resides outside the intranet firewall (with the vendor of the push software). For the Publish and Subscribe model, the client software and a push server reside within the intranet of an organization (inside the firewall) and the push server is linked with the Internet to receive news feeds and extranet information. Each of these push methods has their strengths and weaknesses as listed in Table 1.

4. Push Technology Applications

The push technology is useful in many different types of applications. The push technology has been used for a number of years in the financial world, in live news feeds and cable television (Moukheiber, 1996; Pulver, 1997; Scheier 1997a,b). One of the more common uses today is the automatic downloading of software upgrades and fixes and the delivery of news information to workstations. Push is useful to the end user because it pre-qualifies appropriate information, thus cutting down on research time. It is also vital to the companies that use push to sell their products and services. For example, many magazine publishers utilize push technology to webcast their magazines to their Internet-based subscribers.

Table 1: Strengths and Weaknesses of Two Types of Push Frameworks

Type of Push	Strengths	Weaknesses
Blanket Push	• Client Software is free • Good for updates from outside new feeds	• Need for constant Internet connection hogs network bandwidth • Ads may clutter users' desktops • Limited customization of data sent to clients • Cannot send internal data to users • Security concerns about viruses, espionage, or sabotage
Publish and Subscribe	• Can send internal and external data to users • Users and administrators share management of information flow by customizing data sent to users • Less network congestion because updates are sent only to subscribers • Can provide information to Intranet and Extranet	• Unproven technology can not be utilized for mission-critical purposes • Scalability untested • Management tools not yet available • More administration required at server • Security concerns about viruses, espionage, or sabotage

Similarly software companies utilize push technology to deliver their software upgrades and fixes to their subscribers on the Internet. The push technology is also capable of matching pre-qualified advertising banners to the specific demographic characteristics of the viewers. This means higher advertising rates and greater profit potential for the webcasting companies that offer content since targeted advertising is possible (Himelstein, Neeuborne and Eng, 1997).

Companies also benefit by making use of the push technology to enhance their decision support systems within their intranets/extranets. It allows their employees to make instant changes, based on the notice that they receive when appropriate information is pushed to them thus increasing their productivity. They no longer have to rely on someone to search a site for out-dated material. Many push products are adaptable for Intranet use, sending out only company-created content. And some newer push products are aimed solely at the exploding Intranet/extranet market. Companies can use push technologies on intranets/extranets to deliver timely corporate information to employees. Push delivery is one way to make sure employees get the information they need.

Ford Motor Co. has introduced an extranet called FocalPt that connects 15,000 Ford dealers worldwide. For repair services, for example, dealers can access all information about a car through one central location. Similarly, Countrywide Home Loans (Pasadena, CA) has implemented an extranet that allows its bank and mortgage brokers to access select portion of its intranet and financial database to process loan applications (Maloff, 1997). Push technology allows an organization to build a decision support system in which updated information is pushed to the desktops of all relevant managers within an intranet/extranet. For instance, Haskin (1997c) noted a few years ago that Caterpillar was in the process of designing an extranet to

allow its employees to share information with design experts from around the world to better design new tractors in a shorter time. More and more corporations are building extranets to enhance their performance, and push technology to close the information gap between their managers distributed worldwide.

Dubas and Brennan (1998a,b) discuss the marketing implications of webcasting/push technology. The adoption of Publish and Subscribe type systems should result in better decision making by marketing managers. For example, National Semiconductor added its own channel, called National Advisor, to the PointCast Network to send company news to its employees (Cronin, 1997). Three types of information is shared among employees. First, traditional sales and order information recorded daily by field salespeople is pushed to the desktops of relevant employees. Second, the webcasting of customer requests for samples (captured from the company Website) facilitates the management of inventories. Third, e-mail questions fielded on the web are analyzed by product category and webcasted to individuals affiliated with the product category.

Marketing implications also extend to other important marketing mix factors such as product, price, place and promotions. For instance, product information in terms of new releases, software updates, even information like news about the competitors, and about a company's products can be sent to relevant employees' desktops (DeVoe, 1997). According to researchers, Internet related marketing could result in extreme price competition for goods and services that are perceived as commodities, partially because factors that might permit price premiums (such as store location) are absent, and partially because of the relative ease of comparing prices at different web sites. Push technology also allows information goods such as software patches, software updates, and news to be sent directly to subscribers over the Internet, Intranet and/or Extranet regardless of their geographic locations (Cortse, et. al., 1997; Wagner, 1997). Clearly, advertising and sales production can benefit from push technology. In the absence of push technology, only companies with extremely strong brands can expect customers to actively seek out their web pages. Further, Ads that are webcasted are considered to be more polite than "spam" (i.e., commercial email sent to potential customers), because the former is sent only to people who express interest, via their channel selection, in a particular subject.

5. DSS Methodology for Evaluation and Selection of Push Technology

Table 2 lists several vendors of push technology software that can be evaluated in terms of the following list of twenty decision factors (Sweet 1997): (1) Price, (2) Server, (3) Client, (4) Content Support--Internet/Intranet/Extranet, (5) Server support, (6) Client support, (7) Delivery method, (8) Number of Channels supported, (9) Broadcastable content, (10) Customizable messages, (11) Message response, (12) Segmentation of broadcasting, (13) Statistical routines, (14) Statistical reports, (15) Java applet support, (16) Encryption and security, (17) Scheduling, (18) Freshness dating, (19) Control of advertising, and (20) Long term contractual obligation. Today's MIS decision makers have only been able to rank the choices based on their instinctive understanding of the "soft factors" as purchase cost, operational adaptability, system reliability and maintenance costs, etc. The quantitative evaluation and selection methodology (QESM) briefly described below proposes a simple, yet effective and consistent approach to include all of the above 20 decision factors into the evaluation and selection process of a webcasting, or push technology product for information delivery

over the intranet/extranet.

Table 2: Webcasting/Push Delivery Products

Name of Company	Product	URL
1. Alpha Microsystems, CA.	AlphaConnect StockVue	www.alphaconnect.com
2. BackWeb Technologies, CA.	BackWeb	www.backweb.com
3. Berkeley Systems Inc., CA.	AfterDark Online	www.afterdark.com
4. Ex Machina Inc., CA.	AirMedia Live Internet Broadcast Network	www.airmedia.com
5. IBM info Market, VA.	IBM News Ticker	www.infomarket.ibm.com
6. Ifusion Com Corp.	ArrIve Network	www.ifusion.com
7. Intermind Corp., Seattle, WA.	Intermind Communicator	www.intermind.com
8. Lanacom	Headliner	www.headliner.com
9. Marimba Inc., CA.	Castanet Tuner	www.marimba.com
10. Microsoft Corp., Washington.	IE 4.0	www.microsoft.com
11. Net Controls Corp. & Yahoo! Inc., CA.	My Yahoo! News Ticker	www.netcontrols.com , & my.yahoo.com
12. NETdelivery Corp.	NETdelivery	www.netdelivery.com
13. Netscape Communications Corp., CA.	In-Box Direct	www.netscape.com
14. PipeDream	Simulcast	
15. PointCast Inc., CA.	The PointCast Network	www.pointcast.com
16. Wayfarer Communications Inc.	Incisca	www.wayfarer.com

In QESM, any combination of the above 20 decision factors can be considered as a set of design and selection problems, P = {p_1, p_2, -----, p_{20}} for management, all of which must be met by the push technology product alternatives under consideration. Let us assume that management has to make a choice between the 16 product choices as seen Table 2. Thus, we can consider these to be the 16 push solutions that management is contemplating for the above decision criteria (i.e. 20 decision factors). Each problem P_i can be considered to have a set of *n* attributes which form a vector A_i,, such that A_i = {a_{i1}, a_{i2} , a_{i3} , -------, a_{in}}, which must be met by the solution alternatives (i.e., the alternative technologies under evaluation). These attributes can be arranged in the order of importance starting with the most important. Furthermore, for each element of attribute A_i, a requirement set R_i = { r_{i1} , r_{i2} , r_{i3} ,--------, r_{in}}, is defined in which an entry r_{ik} represents the amount required for the attribute a_{ik} in the attribute set A_i of problem $p_{i.}$ That is, the extent to which attribute a_i is satisfied by the push technology product design choice. Thus, for the set of problem P, we can arrange the requirement sets in an R matrix of size *n* by *l* dimensions, where the *i*th row represents the requirement set of the *i*th problem, such that each row comprises a row vector R_i. Thus R is given by:

$$R = \begin{bmatrix} r_{11} & r_{12}\ldots & r_{1n} \\ r_{21} & r_{22}\ldots & r_{2n} \\ \ldots & \ldots\ldots & .. \\ r_{l1} & r_{l2}\ldots & r_{ln} \end{bmatrix}. \qquad (1)$$

Management is required to provide the measures defining the extent to which each push technology alternative design choice (i.e., solution) possesses attribute requirements of each problem p_i. Thus, management must provide a three dimensional quality attainment array $Qi = [Q_{ijk}]$, where i = 1, 2, ---, m, defines the set of webcasting related problems under consideration by management (here m = 20), j = 1, 2, ----, l, (here l =16 push technology alternatives), and k = 1, 2, ---, n are for the n attribute elements in the attribute set as defined above. For instance, management could set q_{ijk} to a number less than 1.00 ($q_{ijk} < 100\%$) if the requirement r_{ik} of attribute A_k of problem p_i is not met 100% by the push technology solution design choice j. Management could set q_{ijk} to 1.50 (or to 1.00) if management estimates the particular requirement is met 150% (or 100%) by the push technology solution j.

Management must also provide a two dimensional matrix of weights, w_{ik} to evaluate the relative importance of attributes a_{ik}. For each problem p_i, the factors q_{ijk}, r_{ik} and w_{ik} can be used to obtain normalized weighted differences for each attribute as:

$$d_{ijk} = \frac{\left| q_{ijk} - r_{ik} \right|}{r_{ik}} w_{ik} \qquad (2)$$

For all requirements, the above expression can be simplified and rewritten to evaluate how each push technology alternative, i.e., solution S_j (here j = 1, 2,…,16), performs in meeting the requirements of webcasting decision problem p_i (i = 1 ,.., 20) overall as:

$$D_{ij} = \sum_{k=1}^{n} d_{ijk} \ , \text{ which can be written as}$$

$$D_{ij} = \sum_{k=1}^{n} \left| \frac{q_{ijk} - r_{ik}}{r_{ik}} \right| w_{ik} = \sum_{k=1}^{n} \left| Y_{ijk} - 1 \right| w_{ik} \ , \qquad (3)$$

where $$Y_{ijk} = \frac{q_{ijk}}{r_{ik}} \ .$$

A figure of merit can be derived from the above to evaluate how the push technology alternative S_j deals with the whole set of webcasting problems of interest to management. The expression of the figure of merit measure is of the form:

$$F_j = \sum_{i=1}^{m} D_{ij} = \sum_{i=1}^{m} \sum_{k=1}^{n} \left| Y_{ijk} - 1 \right| w_{ik} \qquad (4)$$

The weight, w_{ijk}, associated with the attainment element q_{ijk}, represents the relative importance to satisfying the requirement r_{ik} of attribute A_i of problem p_i. Sylla and Bay (1992) discussed four possible weighting strategies for use in deriving a figure of merit. Several other possible models for selecting weights are available in the published literature (e.g., see Saaty, 1980, 1994). Once the data of the weights are obtained, management can evaluate a figure of merit using the above equation for each alternative push technology. The alternative solution

resulting in the smallest value of the figure of merit is the best solution (i.e., best webcasting or push technology product) for management as it closely matches the requirements established for delivering the necessary information to the appropriate decision makers in the intranet/extranet.

By using the proposed framework, an organization should be able to choose the optimal push technology solution for its intranet or extranet and thus be able to provide company information to its stakeholders in a timely fashion over a secured network. Marketing information can able be made available over the same network. This timely and relevant information should enhance the efficiency and effectiveness of the whole system connecting management, employees, suppliers, dealers, customers, and stockholders.

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