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HOW CAN INFORMATION TECHNOLOGY TRANSFORM THE WAY PARLIAMENT WORKS?

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INTRODUCTION

As one of the driving forces transforming society world-wide, information technology has been a key component in the trend towards globalization and the creation of the "information society." Information technology, which includes communications technologies, has much to offer but many of the potential long-term implications for society remain highly speculative.

Parliaments, like other institutions, have been increasingly making use of information technology, in general at the same pace as mainstream society. Although some view information technology as a source of problems, others realize that it also offers many opportunities for parliaments to fulfil their role more effectively and meet the increased expectations of the electorate. Some of the benefits of information technology are prevented from being realized, however, by reluctance on the part of institutions (and parliaments) to make the necessary changes to traditional procedures and practices. Indeed, in some cases, the negative impacts of such changes may outweigh the benefits to be derived. How information technology can best be used to transform how the Canadian Parliament works but without affecting the "heart" of the institution is something that Parliamentarians must consider.

Keeping pace with the rapid evolution of information technology and the increasing number of its possible applications is extremely difficult. Even ten years ago, the capabilities of today's sophisticated office/business technologies and their acceptance by society would not generally have been considered likely. Even five years ago, the explosive increase in the use of the Internet by hundreds of millions of people and countless businesses and organizations could not have been forecast. In the context of such rapid change, this paper will:

- review the public's expectations for today's information technology;
- identify some areas in which it could be used by parliaments;
- examine possible parliamentary applications for new information technology likely to become available within the next five years; and
- discuss issues that must be tackled by Parliamentarians who wish to exploit these opportunities.

EVOLVING PUBLIC EXPECTATIONS

It has been recognized for several years that the public now expects much more – in the way of increased access, transparency, accountability and efficiency – from all its institutions, including Parliament. Furthermore, these expectations have been heightened by the increased availability of, and access to, information technology. Typically, the public expects a fully up-to-date website for each institution, which covers its mandate, activities, history and organizational structure.

The public's changing expectations, as they apply to parliaments and governments, include:

- *A timely response*: Whereas in the past the public would wait several weeks for a response to a letter to the government, it now expects a response by e-mail in a matter of days.

- *An acceptable level of online (via the Internet) information*: The public expects an institutional website that is up-to-date, well designed and easy to use. The site must have excellent search capabilities because it must be easily accessible by the average citizen and even by schoolchildren. (For more details on what was available on parliamentary websites in 1998, see Appendix 1.) In the case of Parliament, there is a demand for information on legislation, individual Parliamentarians, *Hansard* and committee proceedings.

- *An acceptable level of access to information related to parliamentary process*: Information on the activities in committees and chambers was initially provided mainly in accounts of committee proceedings and copies of *Hansard* available in hard copy (and later, via the Internet). Today, the use of multimedia technology is becoming part of consumers' everyday life and it is not unreasonable to assume that the public will soon expect full multimedia access to proceedings in committees and chambers.

- *An acceptable level of interaction/dialogue with elected officials and the policy process:* Such interaction now includes such items as easy access to Parliamentarians via e-mail and committee websites, where public input can be easily accommodated.

Meeting the public's expectations for improved access to information technology is particularly important in countries such as Canada, where a high proportion of citizens use the Internet. In 2001, 60% of all Canadian households had at least one member who used the Internet regularly either from home, work, school or other locations. Furthermore, 49% of all households had at least one member who regularly used the Internet from home.(1)

AREAS WHERE EXISTING INFORMATION TECHNOLOGY CAN BE USED

In general, legislatures and Parliamentarians have been adopting information technology at the same pace as mainstream society. They have been making full use of the latest in business/office computer systems and software, new sources of digital information, and the wide assortment of telecommunications tools. This section describes existing information technology that could be used to assist Parliament and Parliamentarians further in meeting the public's demands; many of these applications may, in fact, already be in use in some legislatures.

A. Helping Individual Parliamentarians

Parliamentarians and legislatures are now using mainstream business applications such as office software suites for word processing, spreadsheets, and personal information management, as well as for e-mail and accounting and record management systems. These applications allow both institutions and individual Parliamentarians to manage their activities better, communicate more easily amongst themselves and with constituents, and fully exploit the limited financial and human resources at their disposal. Through their connection to the legislature's local area network (LAN), Parliamentarians can use these tools to arrange interviews and meetings and to manage their personal schedules. When the LANs are connected to the Internet, as is the case in many legislatures, e-mails can be sent and meetings arranged on a global basis. In addition, legislatures routinely use intranets (localized versions of the Internet available only to users within an organization) to make administrative or specialized reference material available to Parliamentarians and their staff.

Some of the obvious applications of the Internet for Parliamentarians include:

(1) Statistics Canada, *Household Internet Use Survey 2001*, 2002.

- e-mail, which can be used to distribute newsletters and to receive and respond to requests from constituents;

- extranets, which allow Parliamentarians with more than one office (i.e., a riding office and one in the legislature) to be fully integrated electronically; and

- an individual website for each Parliamentarian, providing a single window for input from and discussion with constituents.

Parliamentarians and their staff are also using the Internet as an invaluable research tool. It can provide access to a wide range of useful information from government sources (both foreign and Canadian, federal, provincial and municipal), academia, electronic journals and magazines, private industry, and numerous special interest and discussion groups. Unfortunately, sorting the "wheat from the chaff" on the Internet can be difficult and time-consuming. The websites of special interest groups frequently provide one-sided or biased information, while data from even the best sources may be incomplete or inaccurate. Such information should not be blindly accepted as accurate simply because it has come from the Internet; it should be viewed with at least the same degree of scepticism as material from other sources. Indeed, professionals using the Internet warn that, without the necessary informed analysis, the vast amount of information it makes available can actually hinder decision-making, rather than help it. The Internet can also provide Parliamentarians with reliable information from commercial online databases covering a wide range of subjects; however, access can be expensive and it takes skill to formulate the questions that will yield the most productive searches.

In the past decade, the telecommunications world has greatly matured. We have seen the advent of new communications technologies such as the pager, the fax (facsimile) and the ubiquitous cell phone, as well as a host of new communication services such as call forward, conference calls and voice mail. Using this technology, Parliamentarians can be "permanently connected" and able to communicate at any time from virtually anywhere.

There are numerous examples of other communications technologies that can assist individual Parliamentarians. Hardware/software packages for low-cost videoconferencing – which add a small television camera, additional hardware and specialized software to a personal computer – function over a wide range of modes of communication. Videoconferencing with several participants can be arranged locally where there is a high-speed network, or over high-speed Internet connections. Personal digital assistants (PDAs) are mobile communication systems giving users full access from almost any location to a wide range of information services such as e-mail,

their own network resources, telephone calls, videocalls (using small video cameras), and the Internet. Some PDAs that are frequently used with digital cellular telephone systems and portable computers also react to voice input by using voice recognition technologies.

B. Communicating with Constituents

For the past few years, many legislatures have been using the Internet, mainly via institutional websites, to provide information to their constituents. The public in numerous countries, including Canada, now has direct access through the Internet to legislation, parliamentary proceedings, and the minutes of committee meetings, all transmitted from the parliamentary websites. The information is normally up-to-date, although this varies greatly among legislatures; in Canada, *Hansard* (the record of debates in the chambers) is available within 24 hours. Many individual Parliamentarians and political parties have their own websites through which they make information available to the public and receive comments. Some features that could be incorporated through available technology to make these sites more comprehensive and user-friendly are detailed in Appendix 1.

C. Enhancing the Legislative Process

The legislative process itself can also be enhanced using information technology. Some legislatures use the Internet to obtain public input through usenet discussion groups on the issues being studied by parliamentary committees. The Internet can be used to make electronic material more readily available or to post comments; in some cases, real-time discussions can take place. Individual committee websites can also be used to attract public participation.

Parliamentary committees increasingly use videoconferencing to reduce the amount of travel for themselves and witnesses. While the quality of videoconferencing technology has been rapidly improving, the costs have dropped dramatically. What used to cost $250/hour some years ago can now cost as little as $25/hour. This trend towards the higher quality, easier use and lower cost of information technology will likely continue.

Information technology might also be used for electronic voting in the parliamentary chambers or to provide access to the Internet from within the chambers and committee rooms.

EVOLVING INFORMATION TECHNOLOGY TOOLS

The overall information landscape is changing quickly as new technologies and applications become available. Attempts to look even five years into the future can create false expectations, because things rarely proceed as planned. Some of the key new technologies that could be ready for use in legislatures within the next five years are multimedia, the Internet, biometrics, and wireless networks.

A. Multimedia

The term multimedia embraces everything from electronic commerce to virtual reality environments and Digital Versatile Disk (DVD) productions, and from traditional audio-visual presentations to multi-screen video walls, interactive training programs, telephony, videoconferencing and teleconferencing. Modern multimedia data are created by the digitization of text, sound, images, video and other content into a common digitized format, which can be easily stored and manipulated by computers and transmitted over LANs and over the Internet. Multimedia technology is quickly leaving the realm of specialized applications and is being more commonly used. Its applications are set to explode in the coming years, partly as a result of increased bandwidth (the capacity to transmit/carry digital information) of the Internet and the expanding processing capabilities of low-cost computers.

B. The Internet

The Internet continues to evolve quickly with new applications appearing regularly. (A brief overview of the Internet's current status is provided in Appendix 2.) In the next few years, the Internet will be the medium of choice for dissemination of information, access to entertainment material, and business transactions. Its increased carrying capacity has made available a much wider range of digital material, including audio and video streaming – a technique whereby data (video, audio and multimedia) can be transferred and processed as a continuous stream. Information is increasingly likely to become available in multimedia format, as the number of Internet users with high-speed connections continues to grow. Internet TV and radio will become increasingly common, due in part to the low cost of entry-level hardware and

software. Not only will each individual computer have an Internet address, but appliances and devices connected to the Internet will permit communications and control to be done online.

C. Biometrics

Biometrics systems use an individual's unique physical characteristics to grant or deny access to computer resources. Some examples of biometrics security devices are scanners that read fingerprints, cameras that recognize faces, and software that responds to voices. These systems offer a practical answer to serious security challenges and go a crucial step beyond traditional passwords or security-access cards. Biometrics systems can ensure that the individual trying to log on to a system is actually the authorized person and not just someone who has found a key card in a desk or a password pasted under the computer keyboard. This extra security is important for applications such as extranets, remote-access devices, and VPNs (virtual private networks providing access to private or sensitive data behind corporate firewalls). Use of biometrics also means that users do not have to remember passwords or keep track of security-access cards. Such use is expected to increase rapidly because of the relative low cost, ease of use, and reliability.

D. Wireless Networks

Wireless networks are another form of information technology that is rapidly becoming more widely used. A "wireless" LAN is a flexible data communications system that is an extension or alternative to the more common "wired" LAN. Using radio frequency technology, wireless LANs transmit and receive data over the air, thereby combining data connectivity with user mobility. With wireless LANs, users can have access to shared information without the need to be plugged in, and network managers can set up or augment networks without installing or moving wires. Wireless LANs offer greater productivity and convenience than do traditional wired networks and can provide users with access to real-time information anywhere in an organization. By connecting the LAN to the Internet, the user has full access to the information and services available on the LAN, the Internet and online services.

POSSIBLE PARLIAMENTARY APPLICATIONS OF EVOLVING INFORMATION TECHNOLOGY

The information technology currently available, or that will be available within five years, offers many potential benefits for Parliamentarians and legislatures. These benefits come at a price, however. Some of the potential applications are described below.

A. Multimedia and Information Technology in the Chambers and Committee Rooms

Using advanced information technology within the chambers and parliamentary committee rooms would enable Parliamentarians to use a much wider range of information sources and communication tools while performing their duties. Through installation of security biometrics in conjunction with a legislature-wide wireless network, Parliamentarians could take advantage of all their modern tools anywhere within the legislature.

Full use of multimedia technology would facilitate videoconferencing and multimedia presentations by committee witnesses. It would ultimately benefit Canadian citizens by giving them full access to all parliamentary proceedings and information via the Internet.

B. Other Potential Uses of the Internet by Parliamentarians and Legislatures

Although Parliamentarians and legislatures are already using the Internet in some ways, many more uses are technically feasible. As described above, the Internet could be used to provide real-time multimedia access to the proceedings of committees and chambers. Committee testimony could be received from remote locations or even direct from constituents' homes. Desktop videophones operating over high-speed Internet connections would allow virtual conferences with Parliamentarians in different legislatures, at all levels of government and in various countries.

The Internet could also be used as a vehicle to promote citizen engagement. For example, sites could be set up with specialized software to facilitate discussions between Parliamentarians and a wide range of stakeholders (including constituents, academics and special interest groups) on any number of policy issues. The Internet could be used to conduct national plebiscites or referendums. As well, the greater convenience of Internet voting could potentially increase voter turnout and make it easier for citizens with restricted mobility to exercise their franchise. However, measures would have to be instituted to ensure that the segment of the population not connected to the Internet was not excluded from the democratic process.

One of the challenges of a geographically immense country such as Canada is that there is sometimes a tendency for the more distant regions to develop a sense of alienation from the political centre. Effective use of information technology may help to dispel a sense of alienation by allowing citizens to participate more effectively in the democratic process, no matter where they reside.

C. Virtual Presence

Secure access to the Internet, using biometrics in a fully multimedia environment, could make possible a number of "virtual presence" applications. Allowing Parliamentarians to vote from outside the legislature and to participate from a distance in its proceedings is now technically feasible, and implementation has been discussed in several legislatures. This could be a real advantage for Parliamentarians, who are often forced by other duties to be absent from the legislature or from a committee meeting.

In a vast country such as Canada, the rigours of travel place a high burden on the personal lives of Parliamentarians, particularly those who represent distant or remote parts of the country. Virtual presence could potentially alleviate this burden by reducing the frequency of travel and could also allow Parliamentarians to use long hours of travel more productively.

ISSUES FOR PARLIAMENTS TO RESOLVE

> … it is not so much the technology itself which matters for the outcomes of these projects, but rather the thoughts and ideas on democracy, which were originally laid down in the projects by their initiators.(2)

This new technology offers many advantages, but it comes with a high price tag. Additional financial costs will be incurred for the technology and the supporting infrastructure and, in many cases, for more specialized support personnel. More importantly, if this technology is to be fully utilized, changes would have to be made to some traditional procedures and practices. As well, some advantages of "face-to-face" contact could be lost. The use of "virtual presence" in the chambers and committee rooms could raise serious concerns.

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(2) F. C. Arterton, *Teledemocracy: Can Technology Protect Democracy?* Washington, D.C.: Roosevelt Center for American Policy Studies and Sage.

A. Costs and Renovating Existing Facilities

Much of the new technology could be incorporated into existing facilities at relatively modest cost, particularly if wireless networks were used to reduce the impact on existing facilities. However, the normal design of many committee rooms is not well suited to high-quality multimedia recording and, depending on the importance placed by Parliamentarians on the "visual impact" of the proceedings, committee rooms might need to be redesigned and refurbished.

Another expense that results from the extensive use of information technology is the cost of security. The use of electronic technology in commercial transactions has revealed many opportunities for surveillance, espionage and malicious intervention (hackers, viruses, etc.). The use of encryption also raises a number of issues.

B. Changes to Procedures and Practices

The use of much of the new technology would necessitate changes to many existing procedures and practices within legislatures. Some of these changes might well be unacceptable. Virtual presence technology raises a number of questions such as:

- What would be the impact of "virtual presence" on the definition of quorum and on what is protected by parliamentary privilege?
- How could the confidentiality of *in camera* meetings be respected when a "virtual presence" could be originating from an airplane or other public location?

Some legislatures, chambers and committees have been televising their proceedings for many years. Future multimedia presentations of parliamentary proceedings via the Internet, both in real time and in recorded form, would not fundamentally alter this situation. The full use of multimedia to record and broadcast proceedings in chambers and committee rooms, however, prompts questions:

- What would constitute the official record? Should witness briefs be included?
- What are the implications of using multimedia technology to enable a wider public participation in the legislative process?

- What are the implications of giving public access to parliamentary events in a variety of formats? (An example would be the need to ensure concordance between different formats while fulfilling official languages requirements.)

To date, little attention has been given to the legal implications of electronic voting in statutory bodies that are meeting "virtually." The electronic environment would also permit more complex weighted voting methods; the legal basis of these would need clarification.

C. Dealing with People

Also of concern is the potential effect of use of information technology on human relations. How Parliamentarians deal with each other, witnesses and their constituents could all be affected, or even perhaps damaged.(3)

- Electronic media enthusiasts advocate the merits of virtual communication but many people prefer face-to-face encounters, for a variety of subtle reasons. How this affects the effectiveness of statutory bodies remains to be explored. The importance of meeting a "warm body" rather than receiving a virtual image may rank differently depending on culture, background or personality type. How can Parliamentarians distinguish between occasions when face-to-face interaction is essential for democratic due process and occasions when such personal intervention may even distort the situation?

- Using information technology to present a virtual assembly may lessen the symbolic significance of an actual assembly.

- Just as the new technology permits a representative to receive communications from constituents, she/he will be able to use it to "consult" with constituents. Whether this involved use of website forms or direct messaging, it might lead to "overload" among constituents, who might begin to perceive such procedures as excessive or manipulative, and not truly responsive.

- The electronic environment will eventually offer a much wider range of ways for presenting the activities of government. Making use of the sophisticated tools that are now being developed will require well-thought-out policies, rather than mere "crisis management."

- The ability of constituents to communicate directly with their representative will raise expectations about the quality of the response. Clearly, the technology can "personalize" responses to a relatively high degree, tailoring them to match individual messages. Moreover, constituents can be linked automatically to a relevant government office,

(3) Parts of this section were taken from *The Challenge of Cyber Parliament and Statutory Virtual Assemblies* by Anthony Judge, Union of International Associations, April 1998 (http://www.via.org/viadocs/cyberass.htm).

registered on specialized mailing lists, or allocated to listservers dealing with their special areas of concern. The challenge is to ensure that the technical ease and efficiency of the process is matched by the high quality of the information disseminated.

CONCLUSION

Although legislatures and Parliamentarians have not thus far been at the leading edge in their use of information technology, they have kept with the mainstream. The rapid evolution of this technology and its growing use by society will likely exert pressure on legislatures and Parliamentarians to exploit its possibilities. In this way, citizens might have better access to – and increased participation in – their legislatures, and democracy could be brought closer to the people. Parliamentarians could enjoy greater freedom, and the legislative process could be enhanced. The technology could also: provide useful information for those reviewing legislation or working on parliamentary committees; and facilitate communication among Parliamentarians and various stakeholders.

On the other hand, some of these gains might exact too high a price in terms of the modifications they would require to existing parliamentary practices and procedures. Moreover, it should be clear that the additional information and enhanced communication made possible by the new technology will not alter the actual decision-making process in a parliamentary environment. A 2000 public opinion poll showed that cynicism among Canadians about their political system is high and rising.(4) Although information technology has the potential to genuinely improve the transparency and responsiveness of the parliamentary system, if not used wisely it risks the possibility of even greater cynicism. Parliamentarians will need to weigh the potential benefits of information technology against its potential drawbacks before deciding which of its aspects to embrace.

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(4) Douglas Fisher, “Making the House Matter: the Apparent Irrelevance of Parliament Has Led to Calls for Fewer MPs – Real Reform of the Institution Should Make Backbenchers Both Relevant and Useful,” *The Ottawa Sun*, 30 July 2000.

APPENDICES

APPENDIX 1

A REVIEW OF THE USE OF WEBSITES IN LEGISLATURES

Of the various information technologies used by legislatures, the public is perhaps most aware of the legislature's website. A major study of the use of websites in legislatures was undertaken for the Scottish Office, on behalf of the Consultative Steering Group on the Scottish Parliament, during the summer of 1998. This report, entitled "Telematics and the Scottish Parliament: Transferable Democratic Innovations," was completed in September 1998 and is available at www.scottish-devolution.org.uk/reports/others/tdi/tdi-00.htm. The Report was prepared in recognition of the operating principles established for the new Scottish Parliament, in particular the principle that the new parliament should be "accountable, accessible, open and responsive." This appendix highlights the main findings of the Scottish report.

USING PARLIAMENTARY WEBSITES TO ENLARGE DEMOCRATIC ENGAGEMENT

The report explored five analytical categories:

- basic information about parliament and government;
- basic information about people in parliament and government;
- providing services to citizens;
- providing for active citizenship; and
- supporting electronic access.

BASIC INFORMATION ABOUT PARLIAMENT AND GOVERNMENT

- The provision of general, "educational" information represents the largest single component of most websites. Some sites provide fact sheets that can be downloaded. Most sites have information about how to visit parliament. The New Zealand site provides an online booking facility for schools wishing to visit parliament.

- Many sites provide historical material about parliament, with some sites offering tours of the parliament building itself.

- Most sites offer information about parliamentary committees, usually giving an e-mail address and access to a committee's home page.

- The rules and the ethics manual for the legislature are sometimes accessible.

- Budgetary information is carried on some sites.

- Many parliamentary sites provide hyper-links to government sites.

BASIC INFORMATION ABOUT PEOPLE IN PARLIAMENT AND GOVERNMENT

All websites contain some personal and other details about Members of Parliament. Examples include the curricula vitae of Members, their diary engagements, their voting records, and an overview of their financial and other personal interests.

CITIZEN SERVICES

The provision of services to citizens is not a strong feature of parliamentary websites. Parliamentary and government publications can be ordered on some sites. A few sites provide details of student placement or job opportunities in Parliament as well as listing parliamentary vacancies.

PROVIDING FOR ACTIVE CITIZENSHIP

The report's authors looked for evidence of the extent to which parliamentary websites encouraged public participation in policy formation and feedback. They noted the provision of timetables for current parliamentary debates, opportunities for citizen involvement, and the development of discussion forums. Some sites identify current issues and invite citizens' views on these. Ease and extent of access to public policy and legislative documents were also assessed and the presence of any form of voting facility was noted.

The main findings were as follows:

- A number of sites explain how citizens might best contribute to the development and formation of public policy. Some sites encourage e-mail submissions to working committees.
- Most sites contain some information on the parliamentary timetable.
- A few sites contain summaries of parliamentary plenary sessions and a search facility allowing the user to access topics of interest that had been the subject of parliamentary debate.
- Some sites offer hyper-links to news and discussion groups.

SUPPORTING ELECTRONIC ACCESS

The report's main findings in this area were:

- Help sections are often very supportive of users, though the nature of that support varies considerably from site to site.
- Most sites are presented in more than one language.
- Some sites offer text-only versions (no images), thereby making access speedier.
- Many sites include a disclaimer on the content of the site, with some clarifying that the printed version is the definitive version of documents.

APPENDIX 2

AN UPDATE ON THE INTERNET

The Internet is a major network made up of smaller networks that agree to communicate using a common set of standards. In the past few years, the Internet has become synonymous with the information highway, on which the number of users and the range of information and services available are increasing at an unprecedented rate. The fact that the traffic (or volume of information/data) on the Internet is said to double every 100 days, has resulted in major upgrades to all elements of the Internet. In some cases, this increased traffic has resulted in congestion for all users and prevented the very high transfer capabilities required for research applications. In response, new specialized high-capacity Internet routes are being built in Canada and the United States, as well as in the European Union. The Internet currently has world-wide coverage, with 147,344,723 hosts in January 2002.(1) Although the actual number is difficult to determine with any accuracy, some estimate that there are 350 million users world-wide.(2)

Most information available free on the Internet consists of government documents, works with expired copyrights, works in the public domain, and material that the authors are making available on an experimental basis. The Internet makes it possible to use e-mail, conduct online conversations, access databases, retrieve files, and participate in a variety of discussions all over the world. The most used service remains e-mail, for which every user on the Internet has a unique identification. The second most common service is for world-wide websites; there were over 38,118,962 sites in March 2002.(3)

An integral part of the Internet is the sophisticated software intelligence that enables users to navigate pathways to a whole universe of information. Information portals are websites or services that offer a broad array of features such as e-mail, forums, search engines, and online shopping malls. The first web portals were online services, such as AOL (America On-Line), providing access to the Web, but most of these traditional search engines have transformed themselves into web portals in order to attract and keep a larger audience.

The Internet's increased carrying capacity has made available a much wider range of digital material, including audio and video streaming. This is a technique whereby data

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(1) Hobbes' Internet Timeline v5.6' by Robert H. Zakon, available online at: http://www.zakon.org/robert/internet/timeline.

(2) Ipsos-Reid, *The Face of the Web II: 2000-2001*, May 2001.

(3) Hobbes' Internet Timeline.

(video, audio and multimedia) can be transferred and processed as a steady and continuous stream. Streaming technologies are becoming increasingly important because most users still do not have fast enough access to download large multimedia files quickly. Streaming enables the client browser to start displaying the data before the entire file has been transmitted. For streaming to work, the client side receiving the information must be able to collect it and send it as a steady stream to the application that is processing it and converting it to sound or pictures. If the data are received more quickly than required, the client needs to save the excess data in a buffer; on the other hand, if the data do not come quickly enough, their presentation will not be smooth. A number of competing streaming technologies are emerging and *de facto* standards should emerge. Internet radio and Internet TV are two examples of this technology, which can also be used to broadcast events on the Internet in real-time.

Another Internet development is voice recognition on web (VOXML), which is currently being used for information on weather and stocks. It uses a very simple vocabulary and can cope with a wide range of voices and accents. With VOXML, users can voice-enable any web page for the visually impaired. This is part of a continuing trend towards a wider range of methods of inputting and displaying information both on the Internet and for information technology in general.

As the Internet has grown, so has the interest from commercial concerns. Electronic mail and electronic cash for purchases on the Internet are common and online shopping is assisted through product specs, icons and photos. Although initially much of the commercial use of the Internet was aimed at consumers, this has changed over the past few years. Major growth is now in the area of business-to-business Internet transactions and this e-commerce is expected to quickly grow in importance. It is estimated that by 2003 the value of Internet commerce will range from $1.8 trillion to $3.2 trillion, with 90% of this being business-to-business transactions.

Governments are also increasingly using the Internet to conduct their business transactions. The Canadian government, along with several others (including those of the United States, United Kingdom, Australia and Singapore), have “e-government” as a goal. The Canadian target date is the end of 2005, and major changes are already taking place in the Canadian government to meet this target date. The Canadian online initiative aims to provide better service to – and build stronger relationships with – Canadians and to serve as a catalyst for electronic commerce.