

**BRIEF SUBMITTED TO
THE HOUSE OF COMMONS
STANDING COMMITTEE
ON CANADIAN HERITAGE**

***THE NFB IN THE DIGITAL, HIGH
DEFINITION AGE:
PROSPECTS AND CHALLENGES***

**BY
JACQUES BENSIMON
GOVERNMENT FILM
COMMISSIONER AND
CHAIRPERSON
OF THE NATIONAL FILM BOARD OF
CANADA**

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EXECUTIVE SUMMARY

The shift to digital and high-definition technologies is now well underway. This new reality has not escaped the NFB, which has been preparing for this technological revolution for a long time, in part by establishing beneficial research partnerships with both the academic community and the private sector. In recent years, the NFB has fulfilled its role of spearheading innovation by conducting research on image quality, access and broadcasting in relation to this transition to digital technology.

Today the NFB is ready to make changes so that it can seize the opportunities presented by this technological revolution, not only to broaden access to its films but also, hopefully, achieve longer-term conservation of its collection and thus help preserve Canada's audiovisual heritage.

This "technology transfer" will require each title in the NFB's collection, whether in video or film format, to be digitized as an electronic file that can be disseminated over the Internet, copied onto DVD or sent to any digital movie theatre (e-cinema).

The transition to digital technology also presents the NFB with an opportunity to transfer its originals to high definition (HD), which is progressively replacing standard definition (SD). Here, too, it has had the foresight to develop innovative transfer methods, in partnership with the private sector, that now remain to be implemented on a large scale.

Over the last few years the NFB has fulfilled its leadership role, with the result that, today, in many fields, and especially in the area of data management, it is at the cutting edge of technology. This situation, of which we are understandably very proud, is above all characteristic of the quality of the work the NFB has carried out to position itself at the forefront of the most recent innovations, thereby demonstrating that it has truly entered the digital high-definition age.

While the prospects offered by these new technologies are very promising, the challenges to be faced in implementing them fully are significant. And despite the expertise it has developed over the years, the NFB cannot envisage making these changes successfully without continuing government support. The vicissitudes of time and the impact of ongoing budget cuts have put the NFB collection in peril. Without transferring the NFB's collection, and buying back expired rights, this collection will be relegated to the annals of history despite the fact that it is being clamoured for by the public, by educators and the world.

1. INTRODUCTION

(...) the Committee believes that government should play a central role in the coming years to ensure that a policy framework for the digital transition is developed in such a way that all stakeholders are equally and fairly involved. Accordingly, the Committee recommends that the responsible federal departments and agencies develop a

comprehensive plan for the digital transition in conjunction with the broadcasting industry and related public, private and not-for-profit stakeholders. 1

The purpose of this brief is to explain to the members of the Committee the undeniable benefits that the NFB would derive from investing heavily in digital and high-definition technologies, from the point of view of both accessibility to its collection and long-term conservation.

The shift from a conventional to a digital distribution network offers the NFB development opportunities that it cannot pass up if it wants to achieve its cultural objectives and continue to define itself as a leader of the audiovisual sector in Canada. Now, at a time when it has become clear that the film and video industry is going digital, the NFB has a responsibility to upgrade its collection and its distribution network as required to remain at the forefront of the most recent technological developments.

At the same time, the advent of high-definition (HD) technology — a format that offers a picture quality almost equivalent to that of film and that is far superior to what is currently available from conventional video — means that it will eventually replace standard definition (SD) technology. This is a reality that the NFB cannot ignore and must not only integrate into its production activities but also apply to the conversion of its collection.

2. THE NFB IN THE DIGITAL AGE

The NFB has already developed the required expertise, having digitized over 10 percent of its titles (in standard definition) and made some of them accessible on servers for theatre screenings, over the Internet and on DVD. It is now seeking ways to speed up the process and get into step with what is undeniably the film standard of the future by converting its collection to high-definition digital format.

The NFB's objective is therefore, in part, to transfer its entire collection to digital format and to broaden access to its titles by means of multiplatform broadcasting: Internet, video on demand, viewing centres (mediatheques in Toronto and Montreal, and film libraries across the country) and closed-circuit systems (server-to-server, e-cinema, schools).

Once the NFB had its entire collection in digital format, it would be able to keep only the digital-format release prints (intended for broadcast) in its possession and would transfer the originals (used to generate the so-called release prints) to the National Archives of Canada. An immediate effect of this would be a considerable reduction in the physical space needed to house the collection and in the amount of time spent handling it. The collection amounts to almost 250,000 items (videocassettes, cans of film, etc.) that the NFB must accommodate on its premises in order to enable access to, and use of, its titles.

The digital format can be transferred to any other medium, regardless of the format of the original from which it was generated. Ultimately, having a digital vault of the NFB's

collection would make it possible to improve access to the titles and ensure long-term conservation of Canada's audiovisual heritage, since any title available in digital format, regardless of whether the original was magnetic videotape or conventional film, could be retransferred to film (the most reliable conservation format). For the NFB this project is particularly important because many of its titles are getting quite old, with some of them in need of restoration in order to offer the best possible visual quality.

By transferring its originals (film and videotape) to the National Archives of Canada for long-term storage, the NFB would help safeguard the audiovisual heritage for which it is responsible. Another obvious advantage would be that this arrangement would separate the release prints from their originals, thus reducing the enormous risk of losing part of Canada's cultural heritage if, for instance, a fire were to sweep through the NFB's premises.

3. CURRENT SITUATION

Since a digitization research project was set up almost 10 years ago, the NFB's sustained efforts have resulted in the digitization of some 1,500 titles of the 11,000 that make up its collection. The benefits soon became apparent: in December 1999 the NFB launched the CineRoute pilot project that has allowed 55 universities connected to CA*net 4 (a Government of Canada broadband network reserved for the use of Canadian universities and research centres) to have access, by streaming, to a library of 800 digitized films. In 2004 we set up an online film club to enable 2,000 members to have access (by streaming) to part of our digitized collection (in MPEG-4) at 300 and 500 kilobytes per second.

So far, thanks to the financial support of the Department of Canadian Heritage's Canadian Culture Online program, as many as 450 titles whose rights have been negotiated or that belong to the NFB have now been made accessible. Last March, the NFB also made available to the public, primarily in the educational system, some one hundred of its films through high-quality streaming over the Internet.

At present, the physical, financial and human infrastructure available to the NFB enables it to digitize approximately 500 titles a year. The NFB now must increase its digitization capacity significantly and begin converting a part of its collection to HD format. To do so and to benefit fully from the many advantages of digital technology, the NFB will have to invest in new equipment and will require a greater number of specialized workers.

4. TECHNOLOGICAL CHALLENGES

DIGITIZATION

The digitization process differs depending on whether the original is available on videotape or film (35 or 16 mm). In both cases, highly skilled workers are required to operate the complex, very expensive equipment.

For video productions that are taped and post-produced in Betacam digital format (the master tape), the method consists in generating an uncompressed digital file, called an AVI, from the analogue data that constitute the title to be converted. The conversion is done in a single step as the analogue data contained on the digital Betacam tape are captured in real time and then digitized image by image by means of a computer-generated. Since 1996, virtually all the films produced at the NFB have been shot in video on account of the lower production costs of this medium, and its versatility.

In contrast, the titles available in 35 or 16 mm must first be converted to digital Betacam format. This is done using a telecine device that compresses the data of the original for the purposes of digital Betacam, a format that cannot carry as much data as 35 mm film, for instance. While the conversion process does provide an opportunity to clean up the picture, remove scratches and balance the colour, it has the disadvantage of involving a loss in picture quality (number of colours, picture transfer speed and picture definition). Transferring 35 mm directly to HD would avoid this loss of picture quality. The following step, as with a video production available in digital Betacam, results in the production of the AVI digital file.

The final step is to apply various computer encoding operations (routines) to the AVI file depending on the desired format (transferable to DVD, broadcastable over the Internet or intended for the Toronto or Montreal mediatheques).

Producing a digital Betacam tape from a film is a very time-consuming operation. One hour of film can represent up to 10 hours of work. It would therefore be a great advantage to be able to eliminate the step of mastering the film to digital Betacam. Skipping this compression step would also make it possible to obtain a digital version of the same quality as film (without loss of data). For broadcast over the Internet, the lower quality is not too much of a concern, being barely perceptible to the naked eye, but when it comes to digital movie theatres (e-cinema), which are becoming increasingly common, it is unthinkable not to be able to offer quality equivalent to that of 35 mm film.

Tests done to date have shown that this process is possible. We must now consider how to set up a system capable of operating on a larger scale, in order to transfer the NFB's 35 mm films in a quality that will allow them to be put back into circulation and in order to benefit from the distribution of Canadian film classics in digital movie theatres (e-cinema).

HIGH DEFINITION

“It is important to note that high-definition television is a major consideration in how DTV services will evolve.” 2

An increasing number of productions are now available in HD format, and their digitization (which involves the same process of conversion to an AVI file as for standard definition productions) does not represent a real problem in terms of know-how but rather in terms of equipment and therefore of costs. Higher definition means a greater quantity of data to process. In fact, it is estimated that digitizing a title in HD format requires four times the storage space and four times the data processing time as digitization of a title in standard definition.

Furthermore, the number of HD productions is bound to continue to increase. The NFB will therefore need more editing stations compatible with the new format, more HD readers and possibly extra digitization units.

The NFB is currently working on converting its entire collection to HD and/or film quality digital format without the need for an intermediate digital Betacam format (see Digitization). We now have equipment that can record the high-resolution (HD/2K) analogue telecine signal and convert the encoding to uncompressed digital, which makes it possible to preserve a quality that is virtually equivalent to that of film and identical, if not superior to HD.

To obtain the same results from a title in video format, the conversion is a much more delicate operation, however. Consequently, in partnership with Algorith, a Montreal company that develops and markets video processing technologies, the NFB has developed some very powerful processing routines that offer some truly amazing results. The NFB must now examine the possibility of setting up this kind of system in order to transfer its entire collection to a digital format providing high visual quality.

ACCESS

Depending on the type of access planned for the digitized title, there are several different encoding routines that can be used. Their purpose is to compress audiovisual programs and make them usable by the greatest number. Some have been developed by the Moving Picture Expert Group (MPEG). They include:

Compressed MPEG-1 files that have become obsolete and are hardly used anymore by the NFB except as part of its Cinereous pilot project and in response to specific requests from certain institutions.

MPEG-2, which is still widely used, especially for generating files that can be transferred onto DVD.

MPEG-4, used for titles intended for the Toronto and Montreal mediatheques, or in some special cases, for the Internet.

Lastly, many institutions (universities and colleges, for instance) would like the NFB to provide them with titles in the form of computer files that can be read by software

programs available on most computers (Windows Media, Real Player, QuickTime, etc.). In these cases, the encoding routines specific to each application program must be used.

INDEXING

Many Internet search engines (Google, Metacrawler, etc.) are now capable of finding information stored as text in a matter of seconds. In practice, this involves indexing a Web page by means of metatags, which are key words that intelligent search tools can find when a user submits a search request.

For multimedia content, indexing often goes no further than the film title or genre. But with the amount of information available on the Net continuing to grow, the NFB has no choice but to provide a more precise means of indexing if it wants to facilitate access to its collection.

In light of these considerations, the NFB is now, as part of the MADIS project, working with CRIM (Montreal computer research centre) and McGill University on a new system in which indexing information will be stored along with the film's digital data in the same electronic file. Users will then be able to locate and view over the Internet a sound, a voice or even a specific face from among the many titles available in its collection.

This new tool makes use of the MPEG-7 standard, which contrary to the first generation of standards (MPEG-1, 2 or 4) is not a video data compression algorithm, but a content description encoding system designed to make multimedia information as easy to find on the Internet as text information is today.

Along the same lines, a second standard, called MPEG-21, has been developed to provide automatic commercialization of any type of multimedia document, as it makes it possible to generate copyright information, provided this information has been encoded.

In practice, once a film has been encoded in a usable video format (MPEG-1, 2 or 4, or other format), it becomes possible not only to add very precise indexing information (MPEG-7), but also to define the rights relating to the title (MPEG-21), thereby simplifying its commercialization considerably. Most NFB titles have still not yet been encoded in MPEG-7 or MPEG-21.

ASSET MANAGEMENT

Along with its digitization efforts, the NFB is in the process of completing development of a centralized knowledge management system called Synchroné. This unique system can easily find all the information relating to any title, from the time the director proposed it until the final stages of production.

The Synchron system is a central hub that links together all the various pieces of information relating to a title. Thus an NFB marketing officer who receives a request will be able to find out the title's format (35 mm, super 16, digital Betacam, etc.), running time or distribution conditions. He or she will also have ready access to related promotional materials (posters, descriptive summaries, photos, etc.). Synchron will ensure more efficient knowledge management and facilitate strategic planning and communications.

At the core of Synchron is the Electronic Copyright Management System (ECMS), which provides information about various rights, both incoming and outgoing, concerning a given title: in what regions the title can be marketed, for instance, in what formats, etc. The ECMS can also be used to determine the royalties that must be paid out to those who hold the rights when a title is sold or broadcast.

The NFB's achievements in managing a heritage collection offer a very eloquent example of the leading role it plays in a broad range of fields. This data management system was designed and built by the NFB because none existed. Even today, it remains the only one of its kind in the country, and it is quite conceivable that it could be used to manage smaller collections from Canadian production companies just as well as larger collections.

5. CONCLUSION

Whether the purpose is to help preserve Canada's audiovisual heritage or to facilitate improved access to its collection, the NFB has no choice but to opt for digital and high-definition technology.

A considerable amount of work has already been completed to this end. The NFB has, on many occasions, demonstrated its know-how and expertise in the area of digitization methods, indexing of the titles in its collection and management of the huge amount of data that its activities require, with the result that the development of new processes, procedures and practices may well ultimately benefit other holders of audiovisual collections.

That said, the challenge facing the NFB is so daunting that it will need additional support that will allow it to invest in new physical and human resources if it is to negotiate this transition successfully and remain, as its mandate requires, at the forefront of emerging technology.

In this regard, the NFB is therefore hoping, as the Government of Canada noted in its response to the Lincoln report, that "to make further progress on the digital transition, the Department of Canadian Heritage will undertake work in collaboration with other responsible federal departments, agencies and stakeholders to clarify policy and objectives, identify gaps, and help develop a plan to address them."

Jacques Bensimon

Government Film Commissioner and Chairperson
National Film Board of Canada

c.c. The Honourable **Liza Frulla**
Minister of Canadian Heritage

1 From the report of the Standing Committee on Canadian Heritage, *Our Cultural Sovereignty: The Second Century of Canadian Broadcasting*, June 2003.

2 The Government of Canada's response to the report of the Standing Committee on Canadian Heritage, *Our Cultural Sovereignty: The Second Century of Canadian Broadcasting*.