InterPARES 2 Project

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A. Overview

The National Film Board of Canada is the primary federal government cultural agency responsible for creating and producing films. It was created in 1939, initially to coordinate the production of federal government films but quickly took on a greatly expanded role during the Second World War as a source of information about the War and Canadians' place in it. In the 1950 *National Film Act* the Board's revised mandate was "to produce and distribute and to promote the production and distribution of films designed to interpret Canada to Canadians and to other nations."

Subsequently the NFB's mandate has been revised several times to take into account the changing audiovisual environment and financial and social situation. In the mid-1980s it was given the tasks of being a "world centre of excellence in production of film and videos" and "a national training and research centre in the art and technique of film and video." This was taken to mean that the NFB was to be on the cutting edge, both artistically and technologically. The inclusion of video meant that the Board was concerned with the creation, use, distribution, maintenance and preservation of electronic records although these were, at that time, analogue rather than digital.

The NFB's productions are generally either documentary films (about 5/6 of the total output), or auteur-driven animation. Most of the work carried out at the Board is now undertaken, and often initiated, from external sources. Once a proposal has been accepted by the Board the primary motor for the creation of the film comes from the director or animator. Suggestions for the materials and methods used in creation of the film may come from both the individual creator and the staff of the NFB, whose personnel include the sort of expertise that will aid in all facets of making the film from creation through distribution to preservation.

The NFB provides its films and videos through a variety of distribution channels: cinema, television, the internet (a high speed route known as CinéRoute and available primarily at select locations such as universities), the CinéRobothèque in Montréal, the Mediatheque in Toronto, public screenings, online initiatives such as the Film Club (which has initiated a pilot project of delivery to individuals through the normal internet) and the NFB's web site, as well as video cassettes and DVDs available to the public for purchase by individuals and video rental agencies.

While the original conception of the NFB was that it would serve as a very small body, coordinating the production of Canadian government films by either the Canadian Government Motion Picture Bureau (an operation that was absorbed into the NFB in 1942) or private agencies, because of the pressure of war it developed quickly into a complete film making establishment with a large employee base engaged in all facets of film making. Under copyright law, the product of the employees became the property of the Board, and there were relatively few questions of intellectual property or third party rights on the materials used in its productions. Over the years reduced budgets meant a decrease in the number of employee-produced films; changing mandates increased the number of independent animators and cineastes who worked with the Board, and whose contracts usually gave only certain rights to it; and the increased number of possible outlets (videocassettes, DVD, the Internet in several forms)

for which new rights had to be negotiated meant that use of the Board's very extensive catalogue became increasingly a complex web of rights management. The response was to set up a computerized system, SEGDA, into which all information about all rights to all NFB productions was to be input. Somewhat before this a computerized financial management programme and database was developed; and other databases, such as the vault management system were created. These have been brought together as the NFB's intranet, known as Synchrone. As it forms part of the computerized system that relates to animation, there will be a short discussion of it.

Because of its role in technological developments (for example, the original work on what became the software Softimage was done at the NFB) the Board has had a relatively long experience in the problems inherent in electronic records. It has a separate division devoted to innovation and technical resources, which deals with some of the problems of preserving the continuity, accuracy and authenticity of film, video and digitally encoded products through time and across migrations. This division is also responsible not just for developing new technologies but for ensuring the Board's ability to respond to those developed elsewhere and for assisting in the development of Canadian standards, or for the development of Canadian implementations of international standards.

Instead of looking at one particular film, and tracing its workflow through the system, an attempt has been made to provide an overview of the context in which animation is created and, after completion, exists through time as entities that can continue to be made available to the public for viewing. The interviewees pointed out that because of the Board's *auteur* approach to film making, each film is unique in its creation and that the procedures adopted for one will not necessarily be applied to any others. This applies to the creation of digital objects as much as to the creation of individual films: the individual director or animator makes decisions which that person feels will accomplish the artistic end in view, with (on some occasions) little regard for the technological, preservation, and other problems that those decisions may entail.

Further, the problems encountered in maintaining and exploiting sixty-five years of film and video holdings in an electronic environment were both directly and indirectly dealt with by the interviewees, which would not have been the case had the workflow of one film been the subject of discussion.

Interviewees

The interviewees included an archivist, an animation producer, a technical supervisor, the head of research and development of Innovation and Technical Resources, one of the people responsible for the Synchrone database system, and the person responsible for implementing the rights management database.

Basic Record Types

While the NFB creates many different sorts of records and documents, its function is to create moving image products that can be used theatrically, broadcast on television, on the internet, or

distributed individually through videocassettes and DVDs. The kinds of records are therefore those that support either the creation or distribution of moving image materials, and include:

1. Text: all correspondence, emails, research reports, contracts, storylines and treatments, etc. This appears in both electronic and analogue form, where the latter is generally a print out of the digital form. Sign-offs on key points in development are now being handled electronically through exchanges of email.

2. Art work: this includes the work done in promoting films as well as the work done in the creation of films, and can include both analogue and digital originals. However, the analogue material is digitized to prepare it for distribution, as intermediate steps to a final product virtually always entail digital components. Animation can include many different methods, such as hand-drawn animation, paper cut-outs, pixilation, puppet animation, pinscreen and computer animation, claymation, India ink drawings, paint on glass, and sand. It is obvious that some of the animation methods, such as puppet and sand animation, will exist only in a recorded form, as found on film, video, or computer image files, while more conventional forms using drawing or painting can also exist as drawings or paintings that are subsequently scanned. Paintings or drawings might be preserved in conventional archives or be kept by the artist.

3. Databases: these are brought together under the umbrella of Synchrone, which is an integration of multiple databases created through in-house software developments. Synchrone is described below.

4. Music: this includes the scores (which are scanned to be included in Synchrone) and the recorded music.

B. Statement of Methodology

The case study is based on interviews with an archivist, an animation producer, a technical supervisor, the head of research and development of Innovation and Technical Resources, one of the people responsible for the Synchrone database system, and the person responsible for implementing the rights management database. The interviews were conducted by Andrew Rodger on two separate occasions, in September 2004 and January 2005, in the presence of the archivist, who wished to expand her own knowledge of the Board's operations by sitting in on the interviews. The interviews were subsequently transcribed.

C. Description of Context

Juridical-Administrative context

The NFB is an agency of the Government of Canada, established by statute in 1939 (revised 1950) to coordinate the making of motion picture films for the federal government. It is funded

by the government through Treasury Board and reports to Parliament through the Minister of Canadian Heritage. Prior to passage of the *Library and Archives of Canada Act,* it did not report under the parts of the *Financial Administration Act* relevant to the National Archives of Canada and its archival documents were therefore not officially the purview of Library and Archives Canada; the new Act appears to provide the Librarian and Archivist with powers over all government documents in all government institutions.

Provenancial context

The documents created by the NFB arise from its administration of its mandate to produce audiovisual materials relevant to Canadians and providing a distinctive, unique view of Canada in the world. These documents include archival records that form part of the recording of the creation process as well as other documents and products that relate to its mandate. Artistic creations may be made by employees of the NFB, or by those engaged by it under one of its many programmes, or through collaborations with other agencies.

D. Narrative Answers to the 23 Core Research Questions

Question 1: What activities of the creator have you investigated?

The initial idea of looking at the NFB as a case was founded on the development of a "liste de livrables" that the archives section at the Board had prepared. This list was created jointly with the legal section as a list of the production documents that had to be archived, but was initially and erroneously thought to have similarities to the workflow developed for the Hollywood animation studio and therefore recommended the NFB as a case study.

The primary activities investigated were the creation of films in the animation section and the general database system known as Synchrone. While these two activities may initially appear disparate, they form part of a continuum.

Question 2: Which activities generate digital entities?

Effectively, all activities in the creation of an animated film at the National Film Board now create digital entities, as textual documents, as budgets and budgetary reports, as research reports, as proposals, as image documents, as sign-offs on various stages of the production process, as correspondence between the animator, the producer and any others in the production team, as contracts between the Board and the animators.

The actual creation of animated films in digital form depends on the preferences of the individual animator, but in all instances the animation is brought to a digital form to produce a release product. A number of animators still prefer to use the traditional forms of animation, and this material is then scanned to be brought into the digital domain. About one third generate their images directly in the digital domain, using a variety of hardware and software. Some use a combination of both analogue and digital methods.

Question 3: For what purpose(s) are the digital entities you have examined created?

In brief, some of the digital entities are created to result in films or videos as per the National Film Board's mandate; and others are located in a system of database modules, which allows for the control and exploitation of these digital entities.

Question 4: What form do these digital entities take (e.g., e-mail, CAD, database)?

In the course of creation the digital entities created by the animators are stored as either TIFF format files (for two-dimensional work) or TARGA format files (for three-dimensional work). These two formats are both industry standards.

The information concerning a production forms part of a production file that has both paper and digital elements. The various parts of this file are located in a database system known as Synchrone, and will include contracts, proposals, research materials and reports, e-mail, etc. These may be found in a number of forms, but generally as Word documents.

> *Question 4a: What are the key formal elements, attributes, and behaviour (if any) of the digital entities?*
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> The digital entities created directly by the animator, or created at the end of his work by scanning, are TIFF or TARGA files. It is possible in some instances where the animator creates directly in the digital domain that the creation will have internal attributes allowing it to interact; this would be the case in some web productions.
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> The production files are in part created in the digital domain and are found in Synchrone, a distributed database system built on the Oracle database engine. It functions as a centralized knowledge management system presenting all qualitative and quantitative information on an NFB production or co-production in one view. Through a Register ("one film, one file") the system can easily find all the information relating to any title, from the time the director proposed it until the final stages of production. It consists of a number of parts and modules, and parts of it allow a certain amount of interactivity. Various views of it can be supplied depending on the individual using it; permissions are also built into it for various actions. At its core is an electronic rights management system, which provides information about various rights, both incoming and outgoing, concerning a given title, as well as to determine the royalties that must be paid out to those who hold the rights when a title is sold or broadcast. This system includes scanned copies of all contracts and relevant documents for the Board's entire output of over 10,000 films. These documents are scanned as TIFFs.
>
> A title codes module is the foundation for a final approval process that combines technical and legal aspects with production content. This allows the electronic signing-off and greenlighting of productions by delegated authorities as they go through various stages towards completion. Synchrone also includes the vault management system, allowing easy access to master copies, production footage and other elements. The financial and budget database systems, set up before Synchrone, have been integrated into it.

Other parts of Synchrone include scans of documents from individual productions, such as photos, posters, and music cue sheets. This, with the contents of other modules, such as news releases, allows for a complete production history.

Question 4b: What are the digital components of which they consist and their specifications?

The digital components are, ultimately, the individual TIFF or TARGA files that are written to film or to digital Betamax, and are stored on DLT.

Question 4c: What is the relationship between the intellectual aspects and the technical components?

The producer is responsible for guiding the animator, determining benchmark points, and assuring the animator is continuing to adhere to the original intent that was approved by the Board. The way in which the technical components are organized or created is of small moment to the final production. Each production is given a separate workflow that is overseen by a technical supervisor, who may provide input into the selection of software, will assist in developing workflows and naming conventions for a given production either for or with the animator, and assists in getting the digital objects to post-production.

Question 5: How are those digital entities created?

The digital entities composing the animation can be created either directly in the computer through the use of graphics tablets, electronic pens, electronic paintbrushes, software, etc., or, in the case of conventionally produced drawings, through scanning of the drawings in the proper sequence.

Question 5a: What is the nature of the system(s) with which they were created? (e.g., functionality, software, hardware, peripherals, etc.)

Animation uses off-the-shelf graphics software like Adobe Photoshop, Aftereffects, Painter, CTP from Crater Software, Flash, Softimage. The software can be modified, either by the animators or by the technical supervisor, to provide the effects desired by the animator; in some instances various pieces of software each give a particular effect desired by the animator, and it becomes the technical supervisor's job to ensure that the various pieces of software are properly integrated. It is also the technical supervisor's job to ensure that all pieces of software are working in the same domain—that for example the software "sees" pixels in the same fashion as they are presented on the screen and does not distort them. The hardware can be either PCs or Macs depending on the animators preference, using the appropriate operating systems. Occasionally the use of particular software determines the use of necessary hardware. When the work is in progress, all files are stored on both the network server and on a backup server. Animators generally also retain a copy on the hard disk of their computers, and often a DVD is burned on a daily basis, and while it is recognized that DVDs are a volatile

medium they are handy to use for a number of short-term purposes. Microsoft Office suite is used for correspondence, reports, etc.

Question 5b: Does the system manage the complete range of digital entities created in the identified activity or activities for the organization (or part of it) in which they operate?

During the course of the creation of a given animation product the digital entities comprising the product are held on the server (with a backup). The other parts of the production—primarily textual materials—are found as part of the production file, which is ultimately located in the Synchrone system.

Question 6: From what precise process(es) or procedure(s), or part thereof, do the digital entities result?

Digital entities are the result of the activities of the individual animator. These entities can be created either directly onto electronic devices (e.g., tablets), which are connected to computers, and in which the image created by the animator can be manipulated; or they are created in the traditional fashion of using paper and drawing or writing instruments with which to create images, which are then scanned, imported into a computer, manipulated, and written out to film or Betamax. In fact, given that animators are considered as "auteurs" it is not possible to generalize on exact procedures, workflows, or steps that are used to create the images that the animator uses to create his completed work. Further, the mandate of the NFB to be on the creative cutting edge means that solutions for a given problem may not be applicable to another similar situation: the time spent in development for most animation works is several years and during that time new software more appropriate to the solution of common problems may have become available.

The digital entities in the Synchrone database system arise from various sources: the creation of the animated film (including all supporting documentation), the ancillary aspects of marketing, distributing, etc., the completed film; and retrospective scanning of various documents such as photographs, cue sheets, music, etc.

Question 7: To what other digital or non-digital entities are they connected in either a conceptual or a technical way? Is such a connection documented or captured?

All productions are given a production number, which applies to all matters dealing with a given production, and which is referred to in all documentation concerning the production. This number follows the production from its inception to the point where it is archived in the vault. All references in all systems to this number will lead to that particular production; likewise, all connexions to a given number will bring forth information about the production. This number applies to paper records, digital records, and digital simulacra of paper records held in Synchrone.

Animation—the final result of the creation is a film, video, or web product; these products are distinctly different and are used in different ways, depending on the audience to which the final work is directed. It is possible that a work may be distributed as film, for cinema use; as

electronic form such as video or DVD for general distribution; as electronic form for use in the Cineroboteque or the Mediatheque. Even though a work might be created in an electronic form, it might at the end be written to film for preservation purposes as film has a known lifespan, it can be inspected with the naked eye, and it can be copied at a later date, if necessary, to new electronic forms.

Question 8: What are the documentary and technological processes or procedures that the creator follows to identify, retrieve, and access the digital entities?

Each production has a production file that includes all administrative paperwork concerning programming, budgeting, financing, initial proposal and support material for the proposal, information about benchmark moments for different programming phases (when the next stage of the production gets greenlighted). However the production file generally is weighted to the beginning parts of the production (including investigative proposals, development proposals, research reports, preliminary budgets, marketing plans, etc.) and little if anything is documented about the actual creation of the film and the twists and turns that its creation may have taken. "Snapshots" of the actual production process (or capturing the activities of the animators and others at a given point in time) are not obligatory and there is no mechanism for capturing them even though producers thought they could be useful.

The individual animator is assisted by the technical supervisor in developing naming conventions to identify the individual components of his animation, although the animator may instead develop his own naming conventions. Each animator uses a computer to assist in the creation process and during production separate frames are both stored on the hard drive of the animator's computer and on the network server. (It is also possible that the animator will write each day's work to a DVD as a backup and as an easily retrieved means of working on particular images.) Each frame in the film is separately identified so that it can be retrieved and worked on if need be by the animator. Written instructions by the animator to the post-production team indicate how the animator wants the different frames treated.

Animation does not yet have information management systems in place that can be transferred across the organization. Instead what happens is that those (producers, technical supervisors, etc.) working on a given project know what is supposed to be done, but this information is not always quickly transferred to the animator, who may start work only to find that he has to rename his digital objects so that post-production can use them. To avoid this sort of problem, and also to determine early on what problems a given animation might pose to post-production, it is common practice to take an animator's output, fairly early in the course of the project, and run it through all the workflow. Should problems be found the workflow can be changed, or other procedures can be changed.

In the case of animation the completed film is stored as both the source files (in either TIFF or TARGA formats) and as various forms of MPEG encoded files. The storage medium at the production stage has changed over the years and is currently digital linear tape (DLT), having in the past included Jazz, magnetic optical, and others; occasionally material on CD or DVD is also kept. It was observed that generally hardware changes much more rapidly than software, in the sense that formats such as TIFF have been available for many years and are compatible with current hardware and operating systems.

Question 9: Are those processes and procedures documented? How? In what form?

The processes and procedures are organized by the technical supervisor. The manner in which they are documented and the form in which the documentation is maintained depends on the individual supervisor, as well as the size of the animation project. Small projects may use informal or lightly documented methods; the supervisor of a large project involving many people may produce a flowchart and other documentation, indicating all stages of the project. It was stated that occasionally an animator's project will encounter problems in post-production because of faulty, insufficient or poor documentation. This documentation might be handwritten notes.

Question 10: What measures does the creator take to ensure the accuracy, reliability and authenticity of the digital entities and their documentation?

"Authenticity" carries varied meanings. The work of animation is directed towards the development of video products. Currently the majority of those products are in Standard Definition, and appear properly on the screen in that form. However, High Definition will be the major standard in 5-10 years, at which time Standard Definition products will not necessarily appear properly on the screen. Should an animator wish to create for the High Definition environment he is ensuring that his work will be shown properly in the future; but this means that his work will not currently appear in the form in which he has created it, but will be compromised. Authenticity is also bound up with accuracy, and accuracy can be relative. The artist's vision is reified on his own computer, which will not display the same signal as that seen on the monitors used in post-production. Therefore the practice now is to pass the first part of the animator's work through the entire workflow to post-production shortly after the animator has started his work so that he knows what the final product will look like if he continues to produce his work in the same fashion.

In many (but not all) instances, the final product is written to film, which can then be used as the basis for all future products. This film is considered to be the authentic document. Restoration of early films (removal of dust, vertical scratches, colour correction, etc.—which is carried out in the digital domain) is done so as to recreate the original as closely as possible. When final products are not written to film, they are written to a digital master, which is currently stored on DLT (but which may be migrated in the future as technologies and storage materials change).

Re-purposing of a production (for example, running a film through a telecine to produce a product that can be used as a video or for television) was considered by several of the informants as doing violence to the original in that it caused losses (e.g., clarity, colour changes) in the course of conversion, and thus the conversion results in a less-than-perfect copy.

Question 11: does the creator think that the authenticity of his digital entities is assured, and if so, why?

The final product is seen as the authentic, completed work. Authenticity and accuracy of representation are seen as two sides of the same coin, because authenticity is not seen as inherent in the individual digital object, but exists only in the final product. The final product—whether

for film, video (standard or high definition) or internet—is not passed without the approval of the animator. It can therefore be considered as the authentic work of the animator. This final product is written out to film or to Betamax as a means of storage, and this is seen as the basic means of assuring the continued existence of the animator's work in the form he approved. Nonetheless, the final product is broadcast on television, or distributed in VHS or DVD form and used on uncalibrated television sets: "The degradation from what the film maker saw in their head to what they're seeing at home on the tv or screen is so profound that ... some film makers just have nervous breakdowns."

Question 12: How does the creator use the digital entities under examination?

Each production treats its digital entities in slightly different fashions, depending on the source of the creation—whether done using traditional analogue animation techniques, done directly in the computer, or using a combination of the two; whether it is 2D or 3D; and depending on the software applicatons used. A typical production will have naming conventions and a workflow developed by the technical supervisor before the individual animator begins (although the animator may commence work without waiting for such assistance and then have to retrospectively rename files). This allows the animator and producer to identify each frame and its position in the work and to save it to the server (and possibly to local hard drives or DVDs) for future retrieval so that the final product can be assembled by post-production. Changes by the animator in the course of the work are generally not documented, or are very scantily documented, however there are greenlight points where decisions are made about continued work on the animation.

Question 13: How are changes to the digital entities made and recorded?

Animators, working under the naming conventions agreed on with the technical assistance of the technical supervisor, can alter any of their work up to the point where the final film is completed. The manner and methods used to make these changes depends on the software being used and the ways in which the animator has been using the software. There is not, however, necessarily any record of the changes made to the digital entities per se; there may be a record indicating that a change in direction was taken in the course of production, necessitating changes in the way the production was carried out.

Question 14: Do external users have access to the digital entities in question? If so, how, and what kinds of uses do they make of the entities?

External users do not have access to the digital entities created by the animator in the course of making his animation; access is given to these for post-production purposes to complete the film.

Question 15: Are there specific job competencies (or responsibilities) with respect to the creation, maintenance, and/or use of the digital entities? If yes, what are they?

The most important individuals in the *creation* of the animation would be the animator, who is responsible for carrying out the ideas that have been accepted by the Board; the technical supervisor, who is responsible for ensuring that all technical aspects of the creative process will

work together (e.g., various sorts of software will work together; software choices will correspond to the final product—e.g., the software will not default to an incorrect frame rate for the intended final product); and the producer, who is responsible for putting the animation through all the steps of production within budget and time limits. These latter may be directly affected by the nature of the intended final product: an animation done at the same definition as film will entail much more computing power and time than will a standard definition product. The post-production employees must be capable of taking the animator's output and turning it into the final product as envisioned by the animator.

Maintenance of the digital objects is carried out by writing the final product to film or Betamax, and storing the original objects on DLT. The IT section is responsible for maintaining all servers on which the animation is stored during the course of its creation, and also for the hardware, which will allow retrieval of the digital objects.

Question 16: Are the access rights (to object and/or systems) connected to the job competence of the responsible person? If yes, what are they?

Yes. Quite obviously the animator must have access to the system to produce his work, as do the technical supervisor, the producer, and any others who are involved in creating the digital objects (e.g., other animators, editors, etc.). The rights would be determined on the basis of each animation, as each generally has a different set of requirements and therefore a different set of people.

All employees have access to Synchrone—but this access might be limited either in action (e..g read-only permissions) or in availability (e.g., access to certain areas might be limited by need—e.g., access to the financial area). Certain persons, such as producers, have sign-off rights on their productions for green-lighting purposes; these sign-offs are indicated through radio buttons, and a space for commentary on their reasons for going forward with (or halting) a given production.

Question 17: Among its digital entities, which ones does the creator consider to be records and why?

There appears to be a consensus amongst producers, technical supervisors, and archives that most of the documentation directly concerned with a given project or production constitutes part of the production record, and should be held in the archives. This would include project proposals, research reports, contracts, budgets, programming, the electronic materials actually making up the film, post-production, distribution, posters, awards, etc. There is a great tendency, in the case of animation, to have considerable information for the first 25% of a production: the initial proposal and support material, programming, budgeting, financing, benchmark moments for greenlighting, etc. There is generally very little information about the actual creation of the film or the creative processes that the animator used, except for the final images (saved as .tif files), which constitute the final film. Interviews with individual animators would have to be carried out to determine exact sequences of events, decisions, etc.; and even this might be inaccurate unless the animator had kept detailed records because some animations take several years to complete. All of the available documentation is in the production files and a large part of

production files is created and maintained as electronic records—for example, as Microsoft Office documents or graphics files—and these are not only maintained electronically but large parts are made available on the intranet (the Synchrone system). It is difficult to know which digital entities that are *not* considered as records by animators, producers and technical supervisors.

Question 18: Does the creator keep the digital entities that are currently being examined? That is, are these digital entities part of a recordkeeping system? If so, what are its features?

All work done using the computer as an intermediary, whether used for the creation of textual materials—correspondence, contracts, reports, outlines, etc.—is kept on the server system and is related to a given project by the project number (assigned before a production is given the go-ahead; once a production is approved, it is given a unique production number). The Synchrone system has been previously described.

> *Question 18a: Do the recordkeeping system(s) (or processes) routinely capture all digital entities within the scope of the activity it covers?*
>
> The processes used must necessarily capture all the digital entities within the scope of the production of an animated product, or it would not be possible to create that product. However, the recordkeeping system does not capture the digital entities created by the animator until such time as the final product is completed at which point the product is written to film or Betamax and DLT and is physically located in the vault. The recordkeeping system acquires digital materials—such as posters, press releases, a variety of promotional materials, approvals, film credits, photographs—which exist in digital form and which—if available only in analogue form—would otherwise have to be digitized to be used in the Synchrone system. Not all digital objects connected with an animation production are located with the recordkeeping system but may be with the legal or financial systems, but become part of the overall record through the Synchrone system.
>
> The current policy is to develop the Synchrone database system so as to have an increasing amount of material related to productions to be created, captured and stored in digital form, all related to the individual production by the production number.
>
> *Question 18b: From what application do the recordkeeping system(s) inherit or capture the digital entities and the related metadata (e.g., email, tracking systems, workflow systems, office systems, databases, etc.)?*
>
> The records in the recordkeeping system come primarily from office systems such as Microsoft Office, as well as from various graphics systems (for photography and posters, for example).

Question 18c: Are the digital entities organized in a way that reflects the creation processes? What is the schema, if any, for organizing the digital entities?

The digital entities created by the animators are organized following naming conventions that are developed by the technical assistants for the individual project. However it was pointed out that the creation of an animation may take two years and is not a linear process. The ultimate schema for organizing the digital entities is the animator's input to post-production, which produces the final product. This schema may even consist of handwritten notes. The nature of the final product will depend on its intended destination and distribution method: cinema, SDTV, HDTV, DVD, internet, etc.

Question 18d: Does the recordkeeping system provide ready access to all relevant digital entities and related metadata?

The recordkeeping system provides access to the final product as stored on film or Betamax.

Question 18e: Does the recordkeeping system document all actions/transactions that take place in the system re: the digital entities? If so, what are the metadata captured?

If different versions of digital entities are created by the animator, these must have a separate identification so that they can be retrieved. These digital entities are not, at this point, part of the recordkeeping system but are stored on the server as part of the on-going production and are available only to those who work on that production.

The digital entities in the Synchrone system are introduced from a number of sources within the Board and may include born-digital as well as scanned objects. It is not known what metadata are captured as this system is unique to the National Film Board and the subject was not queried.

Question 19: How does the creator maintain its digital entities through technological change?

The major interest of the informants was less a concern for technological change with the computer systems that support the creation of the animation productions but rather with the potential alteration of the image file in the course of transmission through the workflow, the integrity and image quality of the images in the production, and preservation of the integrity and image quality of the final product when that product might be in a form not yet conceived. (This is a valid concern given that the average animation production is approximately two years; and several have been in production for well over this average. This can result in technological change taking place during the course of production.) For this reason the preference is to write out the final production from its digital form to film. This is done in part because the Board has long experience in the use, conservation and preservation of film based material, the material conforms to long used international standards, it provides a visible image that can be inspected with the unaided eye, it is physically stable and because it is of higher resolution than digital it can be used as the basis for future digitization into any format and at any desired level of detail. Those productions that are not, because of expense, transferred to film are given a "digital

master" on digital Betacam. The re-use or re-purposing of a production for new markets (for example, for PAL or SECAM markets) would require either a trans-coding of the information from the digital form—with a consequent loss of quality—or would be undertaken by scanning the film form to the required format, and thus better preserve the quality of the original. The source digital sequences of TIFF or TARGA images that make up the production are stored on digital linear tape. The production is also stored in various MPEG formats for the uses of broadcast and publication.

In the case of animation for web-based purposes contractors are now requested to provide the source code so that in the future when software or software versions change it will be possible to recompile the files and continue to use them.

An attempt was made to preserve all parts of a 50th anniversary film made in 1989, including wire frames, object finishes, scripts for scene composition, the Wavefront software used at the time, and the operating system. Five years later an attempt was made to reconstruct the film using the original digital objects, but it was impossible as the equipment no longer existed; a digitized version had to be recreated by using the form written to film.

> *Question 19a: What preservation strategies and/or methods are implemented and how?*
>
> To preserve the final production, it is written to an analogue form—film—or written to Betamax. The digital objects are also stored on DLT. The digital materials are encoded in the Cineon and AVI formats. The Cineon format has the advantage of acting like a digital version of film.
>
> *Question 19b: Are these strategies or methods determined by the type of digital entities (in a technical sense) or by other criteria? If the latter, what criteria?*
>
> The preservation strategy of writing to film is predicated on the fact that film is a known quantity and that it can be transformed into any digital form at a future date by scanning the film.

Question 20: To what extent do policies, procedures, and standards currently control records creation, maintenance, preservation, and use in the context of the creator's activity? Do these policies, procedures, and standards need to be modified or augmented?

Traditional animation was tightly limited in the sense that the film and frame size were standard, the frame ratios were standard, and the projection speed was standard at 24fps. In the case of digital animation, the frame ratio can be what the animator wishes it to be and the frame rate will depend on the video system being used (e.g., PAL or NTSC). The animator must be aware that, for example, computers use square pixels while video uses rectangular pixels and that video editing software uses rectangular pixels and then interpolates them into rectangular pixels. Neglect of this can lead to major problems. But because the NFB sees the animators as auteurs, the animators make the primary decisions about what equipment and software they wish to use. The producer and support staff exist to allow the animator to achieve his particular vision; but it is necessary that they determine in advance what the workflow must be and, to accommodate

what it is possible to do in post-production, the animator must at the outset decide on which of three possible NFB-mandated directions his work will be carried out. These procedures have been determined by the NFB based on the last decade's experience with digital. Which procedure is followed depends on the market for which the product is finally directed: (1) film, for high prestige work and film festivals. This is created at a high pixel count (4000 ppi), and written to film (2) Standard Definition video, for television and DVD release (3) High Definition video, for future television and future DVD release. (In all cases it is possible to write to film, but as the pixel count for SD and HD is not the same as for film release any film release will necessarily be of lower quality.)

No matter what procedure is followed, the image of each frame is written out as a TIFF file (for two-dimensional work) or TARGA file (for three dimensional work). These two formats have been chosen because they are industry standards and are useable across different platforms.

Question 21: What legal, moral (e.g., control over artistic expression) or ethical obligations, concerns or issues exist regarding the creation, maintenance, preservation and use of the records in the context of the creator's activities?

Because most of the Board's work is now done under contract, any such obligations would be addressed in the contract. There are, however, tremendous legal problems relating to the rights in films—particularly in documentary films—which have arisen since most of the Board's work has been done by contract employees. This is one of the reasons for the creation of the rights management database system, which forms a major part of the Synchrone system. Nonetheless, the Board sells rights to several thousand hours of stock footage for which it has all rights.

Producers and others expressed concern about the re-purposing of materials from one format to another, because such re-encoding inevitably introduces errors into the presented product and may distort the animator's original intent.

Question 22: What descriptive or other metadata schema or standards are currently being used in the creation, maintenance, use and preservation of the recordkeeping system or environment being studied?

The NFB is introducing the use of MPEG-7 and MPEG-21 as standards for encoding content and rights about films. These are being introduced to simplify commercialization.

Question 23: What is the source of these descriptive or other metadata schema or standards (institutional convention, professional body, international standard, individual practice, etc.)?

The NFB participates in international standards making bodies and is in some instances responsible for either assisting in developing these or in adapting them to the Canadian scene. These standards are, however, technical rather than descriptive.

E. Narrative Answers to the Domain and Cross-domain Research Questions

Domain 1

Question 1: What types of documents are traditionally made or received and set aside (that is, created) in the course of artistic activities that are expected to be carried out online?

The NFB has created films since 1939, videos since the 1960s, and digital products since the 1980s. All of these products may be repurposed by the Board for use on the internet; and approximately 550 films are currently available through a special high speed internet feed called Cineroute, which is available primarily at Canadian universities. A number of films are also available over the standard internet to participants in a pilot project called the NFB Film Club.

Question 2: What are the nature and the characteristics of the traditional process of document creation in each activity? Have they been altered by the use of digital technology and, if yes, how?

Traditional film animation involves frame-by-frame creation of the film. The standard form of animation is by creating a separate drawing or image for each frame (at the rate of 24 frames for each second of film), copying these drawings in sequence onto film by means of a special camera, and thus eventually creating a completed film. This film will include titles, and a voice and/or music track. The National Film Board has, however, a long history of experimentation in creating animated films and therefore has developed many different ways of making animations aside from the standard forms: in all instances the decision as to the method to be used is left to the individual animator. Currently many animations are still being made in the traditional fashion; but instead of being recorded on film, they are scanned into computer memory and the output is then manipulated to create one or several final products. Perhaps 40% of current animation production is being undertaken directly in the digital domain, through the use of various input devices and therefore do not have to be scanned. Whatever the original source of the images, all these products may be destined for several different possible uses: theatrical exhibition; television; internet; distribution via VHS or DVD.

Question 3: ....Specifically, what is the manifestation of authorship in the records of each activity and its implications for the exercise of intellectual property rights and the attribution of responsibilities?

The activities of various individuals responsible for different activities in the creation of an animation are noted in the credit titles that are found as part of the film. These credits are also found on the NFB's internet web site related to each film; and the information is also found related to each production in the production record as recorded in the NFB archives and in the Synchrone database system. The activities can include (although they are not limited to) the following: director, producer, writer, stop motion animation, design, editing, animation, music and themes, audio recording, sound design, narration, production coordination, development, accounting, administration, creative consultancies, compositing, technical supervision. In the past animators were employees of the NFB and all intellectual property rights, including

copyright, were the property of the employer and thus the property of the Crown. In the last forty years an increasing number of animations have been undertaken by independent animators, and the intellectual property rights in each production are subject to the conditions found in contracts established with each animator prior to undertaking the film. As these contracts can vary in their conditions, the use and exploitation of the animation productions by the NFB can also vary. To know what conditions or restrictions apply to each production a rights database, which is part of the Synchrone system, has been developed and is being populated with relevant data.

Question 4: Does the definition of a record adopted by InterPARES 1 apply to all or part of the documents generated by these processes? If yes, given the different manifestations of the record's nature in such documents, how do we recognize and demonstrate the necessary components that the definition identifies? If not, is it possible to change the definition maintaining theoretical consistency in the identification of documents as records across the spectrum of human activities? In other words, should we be looking at other factors that make of a document a record than those that diplomatics and archival science have considered so far?

The creators view the final product as a record of their collaborative efforts to reify ideas in an audiovisual fashion. The *process* of creation generates records, some of which are electronic; the final product may be an archival record.

Question 5: As government and businesses deliver services electronically and enter into transactions based on more dynamic web-based presentations and exchanges of information, are they neglecting to capture adequate documentary evidence of the occurrence of these transactions?

The NFB provides interactive activities and sales of certain materials through its internet web site, but as this was not the subject of study it is not known whether or not any documentary evidence—adequate or not—is captured.

Question 6: Is the move to more dynamic and open-ended exchanges of information blurring the responsibilities and altering the legal liabilities of the participants in electronic transactions?

Within the NFB successive stages of production activities are now signed off electronically by those having signing authority, and restricted to them. This has not altered the legal responsibilities of the actors compared to earlier sign-off procedures. It is probable that certain legal responsibilities are found in contracts signed between the NFB and animators.

Question 7: How do record creators traditionally determine the retention of their records and implement this determination in the context of each activity? How do record retention decisions and practices differ for individual and institutional creators? How has the use of digital technology affected their decisions and practices?

Traditionally the records creators (i.e. the animators) appear to have kept records according to their own penchant and whim: that is, organized people kept records of their activities, and disorganized people did not. The records that they created, saved and set aside (i.e. those parts of the animation process necessary to the production of a film, for example, individual cels) were not then necessarily saved by the NFB

It would appear that the greatest change in the retention of records connected with a given production has been the move to contract employees. Once a given contract is finished the contractor has no interest in (because there is no funding for) collecting the various parts of the production record, which may be beyond the administrative, financial and legal aspects that have already been captured by the records system. In other words, the raison d'être for the creation of the product may be found in the production records but the actual way in which this was carried out is not documented save for the final product which is released to the public.

Whether these uncollected parts of the production record might constitute archival records cannot be determined in their absence. The change from analogue to digital operations in the creation of animations has not changed this situation.

Domain 2

Question 1a: What does record reliability mean in the context of artistic activities?

For those interviewed, the reliable record is the master film or digital tape as approved by the animator. Because film is a known quantity, because it is subject to international standards, and because it can be visually inspected by the unaided eye, it constitutes the most reliable carrier for the animator's product—whether that product was created by traditional or digital methods. It means that a reliable copy can be struck in any future electronic form by the expedient of scanning the master film in whatever format is desired.

Question 1b: To what extent can the electronic records created in the course of artistic activity be considered reliable and why?

Again, the approved master digital tape is seen as the reliable record. The digital tape may, however, be stored in several different ways to provide a measure of safety—as a digital Betamax, as a DLT, and may be stored in formats that are considered to have long life (e.g., TIFF and TARGA). The component parts of the final product do not appear to have an intrinsic interest—the final product is that approved by the animator.

The final product as approved by the animator is the only reliable reflection of the animator's intent.

Question 1c: What requirements on their form and controls on their creation would make us presume that they are reliable?

The animator is the arbiter of reliability; in the case of multiple hands working on the animation the director of the film is the final arbiter as it is he or she who decides whether the final product is that which is desired. There are, however, multiple problems that arise with the *re-creation* of documents (i.e., in restoring old prints), where such questions as colour values must often be inferred by a trained technician and where there are no records to indicate what the original values were; or where a film is changed in format for a new purpose (e..g reformatting for television, HDTV, DVD, internet all will bring about subtle (or not so subtle) changes to the original).

Question 2a: What does record accuracy mean in the context of each artistic activity?

The accurate record in the context of animation is the one that faithfully transcribes the raw images produced by the animator into the desired format without a loss of any of the characteristics that the animator, as creator, has imbued his work.

Question 2b: To what extent can the electronic records created in the course of artistic activity be considered accurate and why?

If the answer to the above question is fulfilled, then the record is accurate.

Question 2c: What controls on their creation would make us presume that these records are accurate?

The only controls are those of the creator, whose approval of the final product indicates that this product is an accurate and faithful transcription of his original intent.

Question 3a: What does authenticity mean in the context of artistic activity?

The authentic record is the accurate rendition of the artist's work into the final product, as approved by that artist. Reformatting of the final product for purposes other than originally envisaged might be considered by some artists to be a creation of an inauthentic product (as expressed during interviews) but this would depend on the individual artist and to a certain extent on the nature of the product.

Question 3b: To what extent is the definition of record authenticity adopted by InterPARES 1 relevant to the records resulting from artistic activity and from the use of increasingly complex digital technology?

It appears that there is a line connecting accuracy and authenticity: the product, which is considered to be an accurate manifestation of the artist's intent, is the authentic product. However, the manifestation of the product might impugn its accuracy: for example, moving a product from one form (SDTV) for which it was created to another (HDTV) for which a market might exist might introduce artifacts that are considered intolerable by the originating artist. Another artist might consider a similar move of a similar product to be acceptable and therefore accept the modified material as being an authentic representation of his intent.

Question 4: On what basis can the records created in the course of artist activity be presumed authentic? How, in the absence of such presumption, can their authenticity be verified?

The authenticity of the records themselves does not appear to be a major concern to the creators of the films and videos; the authenticity of the final product growing out of the processes that created those records is the concern On the other hand , the legal contract records in the Synchrone system are for the most part scans of paper records that have been maintained in the NFB's records/archives system and thus the records can be authenticated using conventional diplomatics.

Question 5a: How is the authenticity of these records affected by their transmission across space and time?

Artists consider that authenticity of the records can be affected by modifications to the nature of the final product as it is changed to be used in new environments or through new delivery systems.

Question 5b: Are the conceptual requirements for reliability and authenticity developed by the UBC - MAS project [Duranti and MacNeil, 1999] and InterPARES 1 for administrative and legal records generated within databases and document management systems applicable to the records studied by InterPARES 2?

Question 7: Do the participants in electronic transactions have shared access to reliable and accurate information about the terms and effects of the transactions? What would constitute reliable and accurate records of transactions in current electronic service delivery initiatives?

This question was not considered in the study as it did not look at electronic service delivery initiatives.

Question 8: What would be the consequence of issuing guidelines for record creation on the nature of the records of each activity?

The NFB currently has its own systems of ensuring the quality, accuracy and authenticity of records in all media within its own systems. The work of animators is organized with the assistance of the technical supervisor (and others, where necessary) so as to ensure the accessibility of the records for all involved in a given animation production. Guidelines would probably not affect the workflows nor the records creation systems already in place.

Question 9: How can cultural differences, freedom of expression, freedom of inquiry, and right to privacy be reflected in those guidelines?

The work of animators under contract with the NFB, as well as any animators directly employed by the NFB, is often designed to reflect cultural differences, freedom of expression, and freedom of inquiry, and the artistic vision of the individual animator is considered to be of paramount importance in determining the ways in which a given project is expressed. There are no questions of rights to privacy in the nature of the work undertaken (it is designed for public presentation), although the contracts with individual animators would carry certain aspects of privacy rights. Such privacy rights would not include a concealment of copyrights, use rights, etc. connected with the production of a given animation.

Question 10: What technological and intellectual tools would assist creators to generate records that can be authentically preserved over time?

The operative word is “preservation.” In the mid-1990s a decision was made to resurrect a digital product that had been produced specifically for the 50th anniversary celebrations in 1989. It was discovered that neither hardware nor software were available; when part of the hardware and

software were found it was discovered that part of the software could not be used without paying royalties; ultimately the resurrection did not go forward. This is one of the reasons why most digital products are written to film as a final preservation mechanism.

Question 11: What legal or moral obligations exist regarding the creation, use and preservation of the records under investigation?

The NFB is legally bound to produce the film and video products that it is mandated to produce, to allow these to be used in numerous venues over a period of time, and to preserve the ability of them to be used into an indefinite future. It is morally bound to provide the output of its artists in a form that the artists would acknowledge as being an accurate version of their original work.

Domain 3

Question 1: How do the appraisal concepts, methods and models developed by InterPARES 1 for the administrative and legal records created in databases and document management systems apply to the appraisal of the records of artistic activities resulting from the use of the technology examined by InterPARES 2?

Question 2: How do the preservation concepts, methods and models developed by InterPARES 1 for the administrative and legal record created in databases and document management systems apply to the preservation of the records of artistic activites resulting from the use of the technologies examined by InterPARES 2?

The preservation methods used to preserve the final products are a utilization of known analogue systems: the final product is written (in many instances) to film because film is a known product that is not hardware or software dependant and can be visually inspected. Where digital records are kept in the digital domain they are given physical form by being written to digital Betamax.

Question 3: What preservation paradigms can be applied across activities and technologies? What preservation paradigms are required for specific types of records resulting from each activity?

The major paradigm seems to be the conversion of digital to analogue form for the preservation of the final product. (A question not posed by either the investigator nor those interviewed is: what happens when film stock is no longer available? The unthinkable might happen relatively quickly.)

Question 4: What metadata are necessary to support appraisal and preservation of authentic digital records resulting from each activity?

Policy Cross-domain

Question 1: To what extent do policies, procedures and standards currently control records creation, maintenance, preservation and use in each focus area? Do these policies, procedures and standards need to be modified or augmented?

Question 2: Can an intellectual framework or frameworks be developed to facilitate the translation of policies, procedures, and standards into different national environments, sectors, and domains?

Question 3: How can enhanced control over and standardization of records creation, maintenance, preservation, access and use be balanced against cultural and juridical differences and perspectives on issues such as freedom of expression, moral rights, privacy and national security?

Even within the NFB attempts at standardization are not always successful; and "standards" involving the software, workflows, etc. for a given production are worked out between the technical supervisor and the individual animator. Nonetheless, there are the industry standards for broadcast, which must be adhered to and of which producers, directors and animators must be cognizant. A decision as to which of these standards has to be adhered to must be made at the outset of production, when the proposed public is determined. To some extent the question of freedom of expression is moot because the NFB exercises control by determining what projects will be undertaken and which will not; however, if at its completion an artist is wholly against the release of a product the NFB presumably will not release the product (as expressed in interviews by a producer, who also said he had not seen objections carried to that point), but also presumably the artist will not work again for the NFB.

Question 4: What legal or moral obligations exist regarding the creation, maintenance, preservation and use of the records of artistic activities?

The NFB is a publicly funded organization.. It would derelict in its assigned duty should it not preserve those records it has created, or had created for it, so that they can be used. Practical concerns about maintaining institutional "branding" lead the NFB to attempt to re-use its materials and make them available in as wide a variety of formats as possible so that they can be seen in as wide variety of venues as possible.

Description Cross-domain

Question 1: what is the role of descriptive schemas and instruments in records creation, control, maintenance, appraisal, preservation, and use in traditional record-keeping systems in the three focus areas? [artistic to be considered here]

The records management /archives system at NFB uses the RAD rules for control of the records. It has developed *calendriers de conservation* for all areas of the NFB but the implementation of these is not always carried out (lack of personnel, distance from headquarters office). The

documentation relating to the creation of films is very heavy at the administrative and financial commencement of a project (in the research stages before the NFB commits to a project), very light on the actual creation (unless this record is maintained by the individual director or artist), and heavy on the administrative and financial role of publicizing and distributing the final product.

Question 2: What is the role of descriptive schemas and instruments in records creation, control, maintenance, appraisal, preservation, and use in emerging record-keeping systems in digital and web-based environments in the three focus areas? Do new tools need to be developed and, if so, what should they be? If not, should present instruments be broadened, enriched, adapted?

Question 3: What is the role of descriptive schemas and instruments in addressing reliability, accuracy and authenticity requirements (including InterPARES 1 Benchmark and Baseline Authenticity Requirements) concerning the records investigated by InterPARES 2?

Question 4: What is the role of descriptive schemas and instruments in archival processes concerned with the long-term preservation of the records in question?

The NFB has developed its own methods of physical preservation of its products that do not depend on archival processes. For the administrative, legal, financial records of the institution the RAD rules are used.

Question 5: Do current interoperable frameworks support the interoperability of descriptive schema and instruments across the rthree focus areas? If not, what kinds of frameworks are needed?

Question 6: What are the implications of the answers to the above questions for traditional archival descriptive standards, systems and strategies? Will they need to be modified to enable archival programs to meet new requirements, or will new ones need to be developed? If so, what should they be?

Question 7: To what extent do existing descriptive schemas and instruments used in the sectors concerned with the focus areas addressed by this project (for example, artistic activities) support and inform requirements such as those developed by InterPARES 1? Will they need to be modified to enable these sectors to meet these requirements, or will new ones need to be developed? If so, what should they be?

Question 8: What is the relationship between the role of descriptive schemas and instruments needed by the creator and those required by the preserver to support the archival processes of appraisal, preservation and dissemination? What tools are needed to support the export/import/exchange of descriptive data between systems?

Question 9: What is the role of descriptive schemas and instruments in rights management and in identifying and tracking records components, versions, expressions, performances and other manifestations, and derivative works?

The NFB is proposing using MPEG 21, which allows considerably greater metatagging than earlier versions so that such information will be available on each product when distributed. In the 1990s it began creation of an Electronic Rights Management system that will, at full implementation, allow users to know all aspects of all rights pertaining to all parts of all film and video products made by the Board since its creation in 1939. As envisioned, this would mean the capability of identifying all rights pertaining to all segments of each film; this would permit not only easy identification of such rights but also facilitate decisions about whether, for example, a time-limited right purchased from a third party for a particular segment should be renewed at its expiry date (which itself would be automatically signalled by the system). This system does not appear to be dependent on a particular descriptive schema.

Question 10: Is it important to be able to relate the record of artistic activity to the associated expression, performance, product, work, or other manifestation of it and, if so, in what ways can descriptive activities facilitate it?

The record of the actual artistic activity is often spare, and its existence depends on the individual artist or director. The associated product of this activity is seen as the purpose of the activity and the activity itself is secondary.