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Final Report

Status of Digital
Production in Canada

Prepared for

Department of Canadian Heritage
Film and Video Policy and Programs
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Executive Summary

A. Background and Study Objectives

The audio-visual sector is undergoing a historical shift as it adopts digital technology for the production and distribution of audio-visual works. The Film and Video Policy and Programs branch of the Department of Canadian Heritage has commissioned this study to improve their understanding of what types of Canadian content are being produced in digital formats, what formats are being used, what amount of Canadian content is being produced digitally as compared to traditional media, and what types of equipment are being used for these types of productions. The study will assist the Department in making policy decisions related to the production of Canadian content, because the ability of Canadian producers to adjust to the digital evolution will affect their capability to connect with audiences across Canada and the world.

B. Study Findings

1. Digital Technology – Industry Profile

✓ Digital technology is having a major impact on production methods at every level, from production planning to final mastering. All of the capabilities and technologies necessary for digital production are available to Canadian producers.

✓ About 80% of Canadian feature films are still being shot in analog formats. Approximately 5-10% of Canadian television production is done in High Definition (HD), and approximately 50% of Canadian television production is captured in Standard Definition digital, which is the preferred choice for lower budget productions. Nature programs are moving more quickly to HD than any other type of programming.

✓ Based upon these estimates, in 2004/2005 approximately 23 Canadian Feature films were shot digitally, about 418 – 837 hours of television were shot in HD, and approximately 4,187 hours were shot in SD.

✓ A number of factors influence decisions to use digital formats, including whether producers are familiar with digital formats, aesthetic considerations, whether "future-proofing" is desired (making a production more saleable and appealing to future consumers), market demands, shooting conditions (such as low-light conditions), the need to "repurpose" content for other media platforms, and cost considerations.

✓ Producers are using digital technology to repurpose content for promotion and new delivery opportunities. For promotion, repurposing is minimal – for example, existing

movie trailers are posted to web sites. For new delivery, content is typically minimally edited, most commonly to deliver the content in shorter packages to platforms such as mobile devices.

✓ At present the industry does possess the necessary technical skills and facilities to produce digitally, but additional training will be needed to update workforce skills in the coming years.

✓ There appear to be no major differences in the French and English language communities regarding the utilization of digital technology; interviewees described similar views towards training, cost structures, cost pressures, and the importance of the technology.

✓ The cost of shooting in HD is approximately the same as shooting in 35mm, and approximately 10-15% more expensive than shooting in SD digital or 16mm.

2.   Policy Implications

The digitisation of the audio-visual sector presents opportunities and threats for policymakers and those in the audio-visual industries. Digital technology will allow a broader range of creators to tell their stories and distribute them to Canadians. Yet while digital technology does create new opportunities, it also presents threats for the Canadian audio-visual sector. The marketplace forces of the old analog world, which reward commercial success, economies of scale, and concentration, also operate in the digital world.

The conversion to digital technology presents several opportunities and threats:

⇒ **Workforce Preparedness –** To remain competitive, Canada's audio-visual workforce, will need to stay up-to-date with new transformations in the digital production realm.

⇒ **A More Even Playing Field** – Canadian productions are challenged to compete in terms of budget size with the big budget offerings of large, multinational entertainment companies. Digital technology could potentially be a critical factor in competing against bigger budget productions by putting more affordable production and post-production equipment in the hands of the existing resource base in Canada.

⇒ **Access to Distribution –** There has long been debate over the extent to which Canadian productions can access distribution in Canada:

❑ On the positive side, digital distribution will eliminate the costs associated with producing and shipping physical prints. If Canadian filmmakers face lower distribution costs, they should be able to get their products to the market more easily.

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❑ At the same time, satellite distribution is emerging as the preferred method of delivering digital movie files to cinemas. The significant initial investment required to put a satellite delivery infrastructure in place means that the costs of digital distribution are unlikely to drop quickly.

⇒ Marketing – Digital technology may make it easier for Canadian filmmakers to reach potential audiences, for example, by lowering the costs of producing and distributing promotional trailers. At the same time, large multinational media companies will find that their already substantial promotional budgets will allow even greater reach.

⇒ Programming at cinemas will become easier – Cinemas will no longer have to contend with bulky reels of film mounted on fixed platters, so it will become easier to make unexpected changes in programming. In the digital world, cinemas might be more inclined to screen a less commercially attractive film, since showing the film will only require reprogramming a projection. On the other hand, cinemas might also be inclined to more easily "bump" a less commercial film off a screen.

⇒ Reaching remote and underserved audiences may become easier with digital technology – Without the cost of duplicating, shipping, tracking, inspecting, warehousing, and destroying prints, it may become more cost-effective to establish and serve screening venues in isolated, sparsely-populated locations, bringing entertainment, culture, and public service programming to new audiences.

⇒ Cost pressures are emerging, especially on the television front – Interviewees often framed cost pressures as a "cost recovery" issue, and they suggested that broadcasters, the Canadian Television Fund (CTF), or some other entity should "make up" the cost differential. Interviewees stated that assistance is needed at least for the transition period, until digital technologies and HD production upgrades have been made and these new technologies are the production norm. Since the production system is so dependent upon a complex and delicate balance of government, commercial, domestic, and international sources of funding, the integration of new costs is a challenge.

3. Readiness

⇒ In the area of post-production, Canada exhibits a good range of facilities and technicians who are already part of the transition to digital technology. A combination of factors, including the relatively long period of time during which digital technology has been used in post-production, as well as the strong base of service production companies which have encouraged the use of digital technology, has created a sector which offers a broad array of skills, facilities, and equipment to filmmakers.

⇒ In the area of feature film production, Canada is not behind, as the move to digital production has come more slowly to this subsector than in other areas. The percentage of Canadian feature films shot on film is roughly comparable to the percentage of foreign service features shot on film. However, feature film production does seem poised to adopt digital technology more quickly and thoroughly than it has in the past.

New technology will require new skills, new budget templates, and a willingness to embrace the risks incurred by embracing such technology.

⇒ The most immediate challenges are in the area of television, where the question is not "how to transition to digital", but rather "how to transition to HD." On the positive side, digital and HDTV distribution is making steady progress, with broadcasters and electronics manufacturers and retailers supporting the HD format. At the same time, Canadian producers are unsure how they will pay for the transition to HD. In a sector that already faces severe financial pressures, the 5-15% additional cost of producing in HD (vs. SD), represents a tangible hurdle to producing in HD.

4.   Areas for Further Inquiry

✓ **Improving data collection** – A variety of organizations collect data on digital formats used in audio-visual production in Canada. We would recommend that a single, standardized approach be used by all organizations.

✓ **Training** – Workforce training will become a critical component of tomorrow's audio-visual sector. The provision of information about digital media training, certification, and accessibility of training are areas of possible inquiry.

✓ **The Television Sector** – There is no shortage of interest among television producers in moving to HD, but instead a real concern over costs that hinder their ability to move to HD production, and who should pay for those costs. This subject merits further inquiry.

✓ **Encourage the Broad Transition** – Industry stakeholders will be looking to the Government for a broad range of support to facilitate the digital transition. Digital technology allows a producer to think more holistically about his work than ever before, and also creates the opportunity to develop industry support policies which take into account the interests of all stakeholders, and the overall objectives of policymakers, to create integrated policies that contribute in different ways towards the same goal.

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I Introduction

A. Background to the Digital Transformation

The Government of Canada is committed to fostering a more cohesive and creative Canada, and to ensuring that a strong Canadian identity is reflected in and accessible to Canadians in a wide variety of cultural products. To that end, the Department of Canadian Heritage oversees federal audio-visual policy and program activities that seek to:

❑ Reach audiences by ensuring a healthy supply chain continuum from creator to citizen, so that Canadian content is available and accessible to Canadians;

❑ Reflect ourselves by reflecting Canada's rich linguistic, ethno-cultural, Aboriginal, and regional diversity as our shared citizenship and common values;

❑ Invest in excellence by focusing on cultural excellence and rewarding success;

❑ Harness the opportunities of new technologies by taking a proactive approach to technological change in order to take full advantage of its benefits; and

❑ Reach the world by developing international markets so that we can share Canadian talent and culture with the world.

Together with the National Film Board of Canada, Telefilm Canada, the Canadian Television Fund, the Canada Council for the Arts, provincial governments and the private sector, Canadian Heritage plays a role in helping to sustain a strong domestic film and video industry in Canada.

At present, production and distribution of audio-visual media is undergoing a historical shift, from analog to digital, a change that began over two decades ago, making an assessment of Canada's digital audio-visual production especially timely.

1. Convergence

Since the late 1980's, the worlds of computers and media have been merging, a process described as "convergence." This evolution has been made possible by the ability of computers to capture moving images and sound as digital data, which in turn has changed how both professionals and consumers experience media. The ability for audio-visual professionals and consumers to produce, store, manipulate, view, and share digital media is reshaping the media landscape.

Audio-visual productions ultimately seen by audiences are often the result of a combination of both digital and analog production: a feature film, for example, may be recorded using

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traditional analog technology – film in a camera, then converted to a digital format for technical work, such as editing, the addition of special effects, or the correction of color, before being reconverted back into analog format, printed on film stock, and distributed to theatres as a set of film canisters; a television program may be initially captured on a digital media, and then sent to viewers via analog transmissions.

The "audio-visual sector" is not a monolith, and in fact the shift from analog to digital is moving at different speeds, depending upon a variety of factors, including the media being produced, the target distribution method, or market, and format of the content being produced. New media content, for example, is being produced in a digital format since the way in which it is distributed and experienced – via the Internet, or on optical media supports – is itself digital. Archival institutions, on the other hand, which are repositories for large collections of analog material, face a costly, cumbersome, and time consuming process to convert their collections to digital formats. Thus, the type of material being produced, the target market, the method in which the audio-visual material will be distributed, and the financial and technical resources of the producer are all factors which are influencing the adoption and use of digital technology.

While DVD and Internet distribution of media is, by definition, digital, recent developments in the areas of cinema and television distribution, exhibition, and broadcast, suggest that producers may soon be able to produce and deliver content in digital formats to most media windows, from theatrical release through television broadcast. This, in turn, will further encourage the use of digital production methods.

2. Digital Cinema

In the cinema field, exhibition has been the largest impediment to a complete digital chain of production and delivery for feature film. Nearly every cinema in the world uses traditional projection machinery, projectors which generate images by shining light through celluloid film that is pulled through a gate in front of the projection lamp. In 1987, Texas Instruments invented the technology that would eventually make digital cinema projection possible, technology which became known as Digital Light Processing, or DLP. Since then, the industry has moved awkwardly towards implementing digital projection; in May of 2002, for example, Star Wars Episode II was the first major motion picture shot on digital video, and made available for digital cinema projection - but most cinemas lacked the equipment necessary for digital projection, leaving viewers with no choice but to see the film after it was converted to celluloid and projected traditionally.

After fits and starts in recent years, digital cinema projection now seems to be poised to become a widespread reality – although there still is a diverse array of opinions as to how that transition should take place, and at what pace. The November 2005 Report of the Standing Committee on Canadian Heritage reflected these diverse opinions, with testimony from some participants, such as the Canadian Association of Film Distributors and Exporters, Cineplex Galaxy and the Motion Picture Theatre Association of Canada maintaining that there is no need for federal funding for digital cinema, while others, such as

the National Film Board, enthusiastically endorsing Government support for the conversion to digital cinema.[1]

Developments in recent months suggest that a wide scale conversion to digital cinema is finally arriving. The major multinational film studios, through the Digital Cinema Initiatives consortium, announced last July that they had agreed upon a technical specification for digital cinema installations in theatres. At the time of the announcement, several major film studios also announced target dates by which they would be releasing their feature films in both analog and digital formats. This development will encourage cinema owners to step up their plans to install digital cinema projection equipment, and already seems to be resulting in plans for conversion, as noted later in section III (A)(3) of this report.

But these developments are more than just technical changes – they have important policy implications for national film industries, which in most countries have been challenged in obtaining access to their own screens. Films delivered digitally to cinemas – either on discs, via broadcast, or on other digital media – will have lower distribution costs since large, bulky 35mm prints will no longer have to be printed, shipped, tracked, maintained, and handled. Equally important, a fully digital cinema will offer programming flexibility, in part because of lower distribution costs, but also due to the ease with which a cinema manager will be able to move film from one screen to another.

An interesting strategy intended to take advantage of the potential for digital technology to increase access has been developed in the United Kingdom. The UK Film Council's Digital Screen Network is a program under which the Film Council is financially sponsoring the installation of digital projection equipment for 240 screens in 200 cinemas across the country. In exchange for the financial contribution, cinema owners are obligated to (a) allocate a small percentage of screen time to the Film Council for its own purposes, and (b) show a certain percentage of non-mainstream film. By couching the access requirement in terms of a film's genre, language, and look and feel, the policy attempts to sidestep trade obligations and other considerations that might give rise to a challenge. The digital installations are to be installed in Phases; Phase I was completed in February, 2006, with the installation of 50 digital projectors, and as of mid-March, 2006, 25 films have been shown on those screens, including "The World's Fastest Indian", "Good Night and Good Luck", "March of the Penguins", "Brief Encounter", "A Cock and Bull Story", "The Road to Guantanamo", "Hidden/Cache", "Singin' in the Rain", and "The Proposition".[2]

These policy considerations were reflected in the November 2005 Report of the Standing Committee on Canadian Heritage, which included in its recommendations that:

"…the Department of Canadian Heritage develop and manage an initiative to provide ongoing support to film production companies, distributors, and exhibitors of Canadian films. **This initiative should include a component that provides**

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[1]Standing Committee on Canadian Heritage, *Scripts, Screens and Audiences: A New Feature Film Policy for the 21st Century*, Chapter 3, November 2005.

[2] See http://www.dcinematoday.com/dc/pr.aspx?newsID=468

support for the transition to digital and e-cinema. It should also include a marketing component for a national film promotion strategy (e.g., an Internet portal, First Weekend Clubs, etc.).”[3] (Emphasis added.)

3.   Digital Broadcast

The advantages of digital television (DTV) in creating an unbroken, high quality digital chain from producer to viewer are succinctly described by Canadian Digital Television, a not-for-profit industry organization: “DTV signals are generally recorded, distributed and transmitted in a digital component format. Being digital, the signal generally experiences minimal loss of quality from the studio or mobile cameras to the homes. The color is more faithfully reproduced…ensur(ing) sharper pictures, and greater color fidelity.”[4]

As in the cinema world, recent changes on the television landscape are accelerating adoption of digital formats. Consumer acceptance of digital-capable television receivers is rising as prices decline and more content becomes available; one forecaster has predicted that shipments of high definition television sets (one type of digital receiver) will rise dramatically, from 8 million in 2003, to 20.6 million in 2005, to nearly 60 million HDTV displays in 2010.[5]

At the same time, governments are encouraging the adoption of digital television in order to eventually free the broadcast spectrum currently used for analog broadcasts.

In Canada, focus on digital television was first formalized with the creation of the Ministers’ Task Force on the Implementation of DTV in Canada in November, 1995, which issued a report to the Ministers of Canadian Heritage and Industry Canada in November, 1997, with 17 recommendations, a mix of technical and policy recommendations. (See http://www.patrimoinecanadien.gc.ca/pc-ch/pubs/dgrpt/index_e.cfm for the transmittal letter and full report of the Task Force.) In the Fall of 2001 the Canadian Digital Television consortium demonstrated the first Canadian simultaneous over-the-air, cable, and satellite DTV demonstration, and in February, 2003, the first Canadian DTV broadcaster initiated transmissions, followed by the first Pay and Speciality transmissions in August, 2003.[6]

The CRTC has not mandated a cut-off date for analog broadcasts, but has stressed that the conversion to digital broadcasts should, among other things, encourage the production, broadcast and distribution of high quality Canadian programs across the country, and provide benefits to Canadian viewers.[7]

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[3] Standing Committee on Canadian Heritage, *Scripts, Screens and Audiences: A New Feature Film Policy for the 21st Century*, Recommendation 22, page 149.

[4] http://www.cdtv.ca/en/faq/index.htm#2

[5] IMS Research; see http://www.imsresearch.com/members/pr.asp?X=224

[6] From “A Presentation to the World Electronic Media Forum, ‘DTV/HDTV in North America’ ”, Michael McEwen, Secretary General, North American Broadcasters’ Association.

[7] See CRTC Broadcasting Public Notice CRTC 2002-31, found at:
http://www.crtc.gc.ca/archive/ENG/Notices/2002/pb2002-31.htm

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In the United States, under the Federal Communication Commission's "Tuner Mandate", as of March 1, 2006, television set manufacturers are obligated to build combined digital/analog tuners into all television sets 25 inches or larger, and all TV sets must have digital tuners by March, 2007.[8] In December 2005, the Senate passed a budget bill that calls for over-the-air television stations to cease their analog broadcasts by February 17, 2009. After that date, TVs and other electronic devices with old-style NTSC tuners would be unable to receive over-the-air broadcasts, which raises an issue regarding the thousands of TVs that will cease to function at that date.

The US Government is considering the possibility of subsidizing converter boxes for lower-income viewers, to allay the concern that lower-income households will be hit hardest, being unable to afford new digital televisions sets. Further details on the transition to digital and the converter box subsidy are still being worked out, but given the relatively slow pace of movement towards digital television, the potential political backlash of a badly managed transition, and the economic importance of the industry, it is likely that more changes will be announced prior to the 2009 analog cut-off date, assuming that the date holds.

In the EU, individual member states are selecting switch-off dates for analog terrestrial broadcasting; many have chosen 2010 as a switch off date, while six have chosen 2012, and last May EU Information Society and Media Commissioner Viviane Reding recommended an EU-wide cutoff of 2012. In the UK, analog service will begin to be switched off in 2008, with all analog service discontinued by 2012.

The result of this increased interest by consumers in digital television is an increasing interest by broadcasters in producing and delivering digital content. In Canada, for example, CTV is presenting its entire 2005-2006 Canadian dramatic slate in High Definition. The slate consists of six original scripted series, including Corner Gas and Degrassi: The Next Generation, and another six Canadian Movies of the Week; the CBC has installed HD equipment in studios and mobile facilities, and is selectively producing in HD, and programs such as 450 Chemin du Golf, Erreurs médicales, Signé Perrault, Ullumi, and La Savane américaine have been aired on TQS, Canal Vie, and Télé-Québec.

B. Study Objectives

The digital evolution has implications for Canadian policymakers and producers.

For producers, the digital evolution will change the way in which they tell and bring stories to viewers. There are cost, and cost structure differences between digital and analog production. Distribution methods for digital content vary from those available for analog productions, and the skill sets required of technicians and artists using digital tools differ from those traditionally required. Ultimately, the ability of Canadian producers to understand and adjust to the digital evolution will affect their ability to produce and tell their stories to audiences across Canada and the world.

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[8] Source: *Mediaweek*, December 19, 2005.

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Policymakers, in turn, may need to direct resources to new areas in order to assist Canadian producers in telling their stories. Thus, the Department of Canadian Heritage would like to know what types of Canadian content are being produced in digital formats, what formats are being used, what amount of Canadian content is being produced digitally as compared to traditional media, and what types of equipment are being used for these types of productions. The study will assist the Department in making policy decisions related to the production of Canadian content.

Through this study, the Department wishes to create a profile of the digital production industry in Canada, answering questions such as:

❑ What are the specific technical requirements for digital production?

❑ What volume of production (i.e. $/hour / quantity / percentages) is being shot in digital formats and specifically in HD, and how do those volumes vary by language? What types of production are being shot in digital formats? Are there differences in volume with respect to Canadian certified content and foreign location shooting?

❑ What are the reasons for using digital formats? (budgets, aesthetics, etc.)

❑ How are digital productions being converted for distribution across different platforms? (e.g. theatres, DVD, TV, Internet, and mobile devices)

❑ Does Canada's film and television industry possess the technical skills for digital production, especially HD?

❑ Do the French and English language communities face the same challenges in utilizing digital technology?

❑ What are the costs associated with digital production formats versus traditional non-digital production?

For this study, Kelly Sears Consulting Group was to develop a profile of digital production in Canada that:

❑ Provides a qualitative profile of the digital production of audio-visual programming in Canada, identifying the stages of production that may be produced digitally, the major companies involved in production and post production, and the primary formats and technologies being used;

❑ Compares and contrasts the use of digital technology between and among different program formats and distribution platforms, and between English-language and French-language environments;

❑ Describes the decision-making process that producers undertake when deciding to use digital technology;

❑ Describes the relative costs of digital production vs. analog production; and,

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❑ Assesses perceptions within the production community regarding the adequacy and availability of facilities and equipment for digital production;

C. Methodology

This report relied upon a combination of secondary and primary research in order to profile the state of digital production in Canada:

❑ Primary research included interviews with a sample of professionals and industry representatives to elicit information regarding their perception of the digital production environment, their experiences, and their concerns. The Interview Guide and a list of Interviewees are set forth in Appendices B and C;

❑ Secondary research included a review of reports, submissions, or literature available from professional organizations in Canada such as trade associations, funding agencies, crown corporations, certification offices, and professional guilds.

❑ As noted elsewhere in this report, production volumes by format have been estimated using self-reported data obtained from a variety of organizations, and interpreted based upon interviews with industry professionals. Further discussion of measuring the sector is contained in the report under the heading "Areas for Further Inquiry."

II   *The Digital Transformation*

A.   The Digital Evolution

The global audio-visual sector is experiencing revolutionary change in the way media is created and expereinced. One of the primary catalysts driving this change is the rapid development, deployment and improved affordability of advanced digital technology.

Digital media (as opposed to analog media) refers to media that contains binary data that can be rendered into audio-visual images. Digital media, including floppy discs, memory cards, computer discs, and tape, store audio-visual images as a set of data comprised of base 2 digits ("0"s and "1"s), just as word processing documents are stored by computers. Just as a word processor allows an author to manipulate a novel by editing, cutting, pasting, duplicating, resizing, coloring, and shading text at any point in a document, without working from the front to the back, so too do digital media applications allow for the manipulation of audio-visual works, so that they can easily be resized, altered, coloured, and otherwise changed in a nonlinear fashion.

As a result of the adoption of digital technology, the audio-visual production landscape will continue changing at a brisk pace, impacting all aspects of the pre-production, production, post-production and distribution chain. Just as computers have rapidly evolved in recent years, resulting in both new capabilities and new challenges in workforce training, technology integration, and interoperability, so to will the world of media production continue to evolve, bringing both challenges and opportunities.

1.   The Benefits of Digital Production

Benefits of digital production include (a) potential cost and time savings, (b) higher project completion rates, (c) faster processing times and easier manipulation of content, (d) the potential for interactive narrative, or repurposing of traditional content, (e) greater resistance of digital media to degradation, (f) better quality images, and (g) new delivery possibilities.

From those who have already embraced the use of digital in their production processes, the feedback is favourable. Topping the list of perceived benefits is the cost and time savings realized throughout the production and post-production phases due to the availability of low-cost digital video cameras and editing tools.[9] Although there is the potential for significant cost and time savings, some suggest that the savings are partially offset by conversion costs associated with maintaining both analog and digital formats in parallel, and in some cases digital technology can actually result in higher costs. In fact, the cost picture

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[9] "Digital Post Democracy" by Steve Hamilton, *MovieMaker*, Issue 48, Fall, 2002:
http://www.moviemaker.com/issues/48/digitalpost.html)

is complex, and we delve into this more fully later in this report in section III (D), "Why Shoot Digitally."

The increasingly widespread availability of affordable digital technology will increase project completion rates. One lab executive suggests that "labs are graveyards for shows whose funding and energy ran out at the 95 percent point"– and digital production is helping filmmakers get over that hump.[10]

The gradual shift from traditional 35mm film stock to digital image acquisition media is already bringing significant benefits to filmmakers. Producers praise the medium for its fast processing times and easy manipulation. Footage can be reviewed immediately after shooting. Although several factors may lead Directors to film the same scene several times, one reason for reshoots is that a Director cannot truly see what he has filmed until after the film stock in the camera is processed. With digital technology, Directors may be able to eliminate some of the costly reshooting previously caused by the lag time that 35mm film production once had, as production staff would wait to view "dailies"[11] to determine whether the previous day's shoot was indeed successful and the film was correctly processed by the lab. Additionally, without the ability to instantly review footage, filmmakers would frequently rely on having to do numerous takes, seeking to make sure they would always have the necessary footage available in post-production. This process generally resulted in increased production time and increased film processing costs – a practice which is not required with digital productions.

With the ability to isolate frames and digitally manipulate colors and images, producers are further empowered creatively to develop more convincing scenes with unparalleled special effects, such as in *Ryan*, the 2004 award-winning short subject sponsored by the National Film Board, which used 3-D computer generated animation to bring its characters to life.[12]

Digital production also opens the door for the possibility of interactive narrative[13], and the repurposing of content. Although most attempts to date at interactive narrative have experienced less than stellar results, a few pioneers of interactive narrative, such as *Tender Loving Care*[14] and *Point Of View*[15], use a series of questions after every chapter approach on the DVD to gauge the viewer's psychological profile, before adapting the story to suit the viewer. "The concept of 'Thinkies', movies that are said to thoughtfully engage the viewer in a non-linear, interactive environment, has become a major talking point among modern filmmakers. We are now shifting away from traditional, linear, non-interactive movies dominating film culture and moving more towards a more participatory film structure.

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[10] "Digital Post Democracy" by Steve Hamilton, *MovieMaker*, Issue 48, Fall, 2002
[11] "Dailies" are the portions of a production filmed during a single production day, and reviewed immediately once they become available to determine how a day's production looks.
[12] See http://cgw.pennnet.com/Articles/Article_Display.cfm?Section=Articles&Subsection=Display&ARTICLE_ID=208290 for an in-depth discussion of *Ryan* and the technology and vision behind the film.
[13] Ibid.
[14] See http://www.aftermathmedia.com/tlc/
[15] See http://www.imdb.com/title/tt0288176/

While being only minorly successful, films like these highlight the opportunities before a filmmaker in the 21st century."[16]

Digitally stored content is also <u>less susceptible to damage</u> during distribution, and can be expected to maintain first-grade quality during duplication, regardless of age. This is a potentially major improvement over film, the integrity of which was jeopardized with each reproduction, as well as each decade that passed. Digital images "will be pristine whether a film has been shown 100 times or 1000 times" stated one digital cinema executive.[17]

Digital broadcasting, available through DTT (Digital Terrestrial Television), cable or satellite subscriptions, offers viewers three prime advantages; <u>more channels</u>, <u>better quality picture</u> and <u>the opportunity for enhanced services</u> such as on-demand, screen program information and parental control features. Digital transmission also offers broadcasters improvements in terms of how much data it can transmit, how consistent the data stays over distance and what type of data the signal can carry.[18] Digital signals can carry much more information than analog signals. Additionally, although both analog and digital signals get weaker with distance, the quality of analog signals worsens as the distance between the receiver and signal increases, while digitally transmitted pictures stay perfect until the carrier signal becomes too weak for the signal to pick up, at which point the image is lost.[19] Another benefit to digital transmission is that the same signal used to send high-definition picture it allows for "multi-casting" of up to four standard definition pictures, potentially increasing transmission capacity.[20]

Digital technology allows for <u>new and different distribution opportunities</u>. Although not related to digital production *per se*, digital content, whether created in an analog format and later converted to film, or created digitally in the first place, can be delivered to audiences in new ways.

2. Digital Drawbacks

Although digital technology has many advantages, it is not flawless. Criticisms include (a) that the technology is not as capable as analog technology, (b) that digital technology leads to undisciplined filmmaking, (c) that the storage benefits of digital technology are not as great as widely believed, and (d) that costs can be higher.

<u>Criticisms of the technology itself</u>: Since inception, there has been debate over whether or not digital technology is as refined as that of 35mm film. Critics believe that digital cameras do not offer the same colour palette, depth of field control, flexibility, and sensitivity to light that can be achieved with traditional analog technology – and while these criticisms have been reported in the press, they also emerged over the course of our interviews. With regard to colour, critics argue that there is a more limited colour spectrum

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[16] Ibid.

[17] Ibid.

[18] See http://www.pbs.org/opb/crashcourse/digital_v_analog/multicast.html

[19] Ibid.

[20] Ibid.

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available in digital technology, and many professionals in the industry believe that colours appear more vivid and more detailed with releases using traditional production methods. With regard to depth of field, critics maintain that digital cameras do not offer the same depth of focus as that offered by tradition. However, for every critic of digital technology, there are advocates. One recurring theme that emerged from our interviews is that digital technology is as capable as analog, but that filmmakers have not yet learned to utilize the full capabilities of digital technology. One producer spoke admirably of a cameraman with whom he had worked: "He could do things with digital cameras that we could never do with analog technology, but he is one of the few cameramen who know the technology well enough to manipulate it that well." Another producer, speaking to the depth of field criticism, maintains that digital cameras offer greater depth of field than analog cameras, that digital cameras can portray both foreground and background in sharp focus, as compared to the lenses used in traditional methods. In the case of some formats, compression is another consideration. A very high resolution image may require more bandwidth for transmission than is available. In such a case "lossy" compression is used for digital HDTV systems, which also causes the picture to be distorted, countervailing the high quality of the medium.[21]

Although differences of opinion concerning current quality continue, all agree that digital technology is advancing rapidly. One producer spoke of planning to shoot her next film using the latest generation Panavision Genesis camera: "We conducted extensive tests, and could not see any difference between images shot on 35mm and with the Genesis." As another interview said, "Film industry equipment will now be subject to the same rule as computers: obsolescence within three years." If true, there will be further implications, such as a greater need for ongoing training in the industry, and a need for equipment houses to rethink their business models.

Regardless of these debates among the technoliterati, it is too early in the use of end-to-end digital technology to determine if general cinema audiences have a preference.[22] Equipment manufacturers have been strong proponents of conversion to digital technology, and have at times announced that digital cinema projection is "as good as" traditional 35mm, or that audiences have a preference, but given the lack of digital cinema installations, and the consequent lack of broad, independent surveys, it is premature to assess audience preferences for commercially installed digital projection systems vs. analog systems. Television, on the other hand, has benefited significantly from the technological advances in digital, high-definition content, as demonstrated by the growing appetite among consumers for High Definition television sets.

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[21] A **lossy data compression** method is one where compressing data and then decompressing it retrieves data that may well be different from the original, but is "close enough" to be useful in some way. This type of compression is used frequently on the Internet and especially in streaming media and telephony applications. The software applications used to manipulate data are typically referred to as codecs (short for "**co**mpression" and "**dec**ompression") in this context. Contrast with lossless data compression. Depending on the design of the format lossy data compression often suffers from generation loss, that is compressing and decompressing multiple times will do more damage to the data than doing it once.

[22] "A Galaxy Far, Far Away Is Becoming Fully Digital" by Ian Austen; *New York Times* - Technology, May 25, 2000.

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Filmmaking discipline: Another concern identified by those working in the business is that, with the realities and pressure to produce better, faster, and cheaper, the art and creativity of film making may become compromised as a result of the speed with which digital technology allows production to take place. The mechanics of film production that may have perhaps "slowed down" production time may also have served to hone the art and discipline of storytelling. Although difficult to quantify, this concern is mentioned in trade publications and arose over the course of our interviews for this project. As one interviewee put it, "With the cost of film stock, you had to be sure before you turned on the camera that you had prepared adequately. With digital, it is cheaper to engage in multiple retakes with less thought."   Another interviewee spoke of production to screen time ratios for documentaries, and said that, in the "old" analog world, approximately 40 hours of raw exposed footage would yield 1 hour of screen time. With digital technology, that ratio has increased steadily, to 60, then 80, and as much as 100 hours of raw footage now yielding a single hour onscreen. And, the increased volume means a need for additional assistants, additional post-production time, and other ancillary inputs.

Storage challenges: Although digital formats are less susceptible to damage, potential issues have been identified with long term storage. Magnetic computer discs ("floppies") and DVDs were at first felt to be invulnerable to the ravages of time, but both have been found to degrade. Furthermore, formats change over time; for example, early digital storage media, such as 5.25 inch floppy discs, are virtually unknown today, as are the optical drives which read those discs. Thus, while digital media is often perceived to be "indestructible" or "permanent", experience from the recent past suggests that digital media does not eliminate preservation and archival issues, but instead creates new issues.

The cost picture is complex, and more fully described below in detail. Previously, we noted that the costs of digital or high definition production can be lower than comparable analog production costs. Paradoxically, they can also be higher. For example, a television producer making the switch from SD digital to HD digital may have to construct new sets, and adopt new makeup and lighting techniques before she can shoot in HD, incurring both those costs as well as the costs of the purchase or lease of more expensive HD equipment itself. We explore and explain this apparent paradox later in section III (E) of this report.

Finally, in terms of digital television, maintaining both analog and digital signals simultaneously is creating some complications. The need for conversions between formats is currently a consideration for producers, broadcasters and distributors. For example, since HD programming is presented in the 16:9 aspect ratio, while older programs present in a 4:3 ratio display, older programming needs to be converted in the digital environment to fit the wider screen, which results in a somewhat stretched-out and distorted picture.[23] According to Fred Mattocks of the CBC, "Protecting 4x3 is a critical issue, while not kneecapping the HD experience."

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[23] See http://en.wikipedia.org/wiki/HighDefinitionTelevision

3.   The Distribution Hurdle

Although industry insiders are hopping on the digital train at a breathtaking rate, one major hurdle exists to total saturation: the "distribution bottleneck." In 2001, only 30 screens were reported equipped to project a digital image. Numbers reported in the spring of 2005 indicated an increase to 335 screens worldwide out of a total of an estimated total of 150,000 cinema screens worldwide, although these numbers have increased since then and now appear poised for rapid growth: for example, Christie's, one manufacturer of digital cinema projection units, currently reports that it alone has installed 372 units worldwide; of the 152 projectors Christie has installed in North America, 9, or just under 6%, are installed in Canada.[24]   Christie's numbers coincide with those offered by Texas Instruments (TI), a pioneer in the field of digital cinema, which indicates that there are a total of 9 digital cinema projectors in Canada, of a total base of app. 2,980 screens in 628 theatres.[25]   Where no digital projection exists, digitally produced movies need to be transferred to film for traditional exhibition.

Digital cinema projection is basically the last critical link in the digital evolution chain for feature film; however, recent global developments give significant cues as to the direction, and the pace, that this conversion will take place. The consensus reached last summer between the major multinational studios and equipment manufacturers in terms of technical specifications for digital cinema equipment and installations represents a significant step towards digital progression, and is hastening the pace towards installation of digital cinema projection infrastructure.

⇒   Last Fall Digital Projection International (DPI), a manufacturer of high-performance projection systems, announced an agreement with UFO Moviez (part of the Valuable Media Group) for the sale and installation of 500 digital cinema projectors in India.[26]

⇒   In late October, 2005, SES Astra (A European satellite company) and T-Systems (A branch of Deutsche Telekom, owner of T-Mobile) announced the creation of the first Europe-wide distribution network for digital cinema, offering a full spectrum of services for the broadcasting, storage and administration of digital movies.[27]

⇒   In December, 2005, XDC, a Belgian company, announced that it had financed and installed over 200 digital cinema screens over 9 countries (Belgium, The Netherlands, Luxembourg, Germany, Switzerland, Austria, Spain, France and Sweden), "in less than 6 months" and announced that it would be more aggressively expanding in 2006.[28]

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[24] Screen Digest, April 2005; estimates for world screen count from http://kmpartners.org/papers/insasia/imminent.shtml; Christie installation numbers at http://www.christiedigital.com/markets/digitalCinema/digitalCinemaListing.asp

[25] http://dlp.com/dlp_cinema/dlp_cinema_theater_search.asp; http://www.mptac.ca/english/stats.html

[26] See http://www.digitalprojection.com/content/view/240/2/

[27] See http://www.t-systems.com/en/Home/PressAnalysts/PressCenter/id=138298.html

[28] See http://www.dcinematoday.com/dc/pr.aspx?newsID=377

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⇒ In December of 2005 it was announced that Regal Entertainment Group, AMC Entertainment Inc. and Cinemark USA partnered to develop a business plan to "work with manufacturers to reduce the cost of digital equipment through volume purchasing for their 13,000 screens and other participating exhibitor screens."[29]

⇒ Carmike Cinemas has contracted with AccessIT's Christie/AIX subsidiary to install 2,300 digital projection systems in theaters throughout the U.S. This project is slated to begin immediately and be completed by October 2007. Total costs are estimated at US$100,000 per screen, but economies of scale are expected to drive down the actual price.[30]

⇒ In early January, 2006, Thomson announced that its Technicolor Digital Cinema unit had agreed with US cinema chain Century Theatres to install its digital screens in its cinemas, pending the result of a trial run of the technology in the first quarter of 2006; the test-run will involve the deployment of 90-120 of Thomson's digital screens in Century Theatre cinemas, with full deployment to involve placement of digital systems throughout Century's network of 1,000-plus screens.

⇒ Plans to support digital cinema have been announced in other countries, as well. In addition to the UK project mentioned previously, in China, the China Film Group Corporation is planning to build 200 new digital cinemas over the next few years. In Ireland, plans commenced last year to install Avica digital projection equipment in every cinema in Ireland, 515 screens in total, at a cost of US$53.3 million, raised from private investors. And, there are government funds generally available in other countries, such as Germany and France, for exhibitors to upgrade their facilities.

The television business faces a similar issue, with optimal viewing conditions for digital content requiring access to digital receivers and content delivered in digital format. According to Danielle Levitas, Director of IDC's Consumer Markets and Technologies research, "Demand for DTV is a global phenomenon, with HD programming and TV sales driven by the United States and Japan followed by Korea, Canada and Australia." She continues by stating that "with the combination of digital infrastructure build-outs, and declining price points, the worldwide market for DTV's will grow from more than 12 million in 2003 to 118 million in 2008."[31]

Progress towards digital television appears to be moving at brisk pace on a global basis, although reports from different sources vary in their specific findings. In Canada, although 70% of the population subscribe to cable television, only 30% subscribe to digital cable.[32] In the United Kingdom, digital television penetration is claimed to have reached a 66% penetration level.[33] A recent study from the Leichtman Research group (LRG) suggests that

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[29] "Top Exhibitors Roll-Out Blueprint for D-Cinema" by Nicole Sperling, Amusement Business, December 15, 2005.

[30] "Digital Cinema Grows Under Carmike, Christie Pact" by Gregg Kilday, Amusement Business, December 20, 2005.

[31] Worldwide and U.S. digital TV 2004-2008 Forecasts: Its Time Has Come, published by IDC, May 20, 2004

[32] See http://www.digitalhomecanada.com/hdtv

[33] See http://www.digitaltelevision.gov.uk/

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HDTV receiver penetration reached 12% in the U.S. in 2005, up 7% from prior year. Although awareness is very high at 89%, cost remains a major barrier for most households, and growth in this area is expected to accelerate as equipment prices decline. Estimates from this study expect U.S. penetration to reach 55% in 2010.[34] In another study, it is suggested that North America is leading the pack with 26% digital receiver penetration followed by Japan at 24%.[35]

As it relates to the digital transition for feature films as well as television, the quality of the consumer experience can only be as good as the weakest link in the content chain. As digital or HD content becomes increasingly common and consumers embrace HD television receivers, the ability of consumers to receive content distributed in digital, high-definition delivery formats becomes the final and critical part of the digital transition puzzle. For the television market, this necessitates the broad availability of either digital cable transmission systems, digital satellite services, digital terrestrial broadcasting or emerging, broadband-based distribution technologies.

As distribution hurdles are overcome, large studios and production houses alike will be encouraged to avail themselves of the many benefits of digital production and move forward towards completing the digital evolution.

B. The Production Process and Technical Requirements

1. Pre-Production

As it relates to the digitization of the production chain, perhaps the most important development as part of the pre-production process is the emergence of increasingly sophisticated "previsualisation" technology, sometimes referred to as "Previz."

In many cases, special effects shots require complex camera setups and difficult camera moves. In order to better understand how to approach complex scenes, previsualizations are created to help the director and production teams determine the best way to shoot a scene. The Previz artist creates a 3D animation of the set, allowing the director and production group to view the animation with different camera positions, movements, and lenses applied to the software's virtual camera. They can also review the animation with the actors and set pieces in various locations. [36]

2. Production

On the production side, the primary area of interest as it relates to the digital transition is digital cinematography. Digital cinematography is the process of capturing motion pictures onto a digital medium in place of traditional film. The term covers several different types of digital image acquisition technology.

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[34] See http://LeichtmanResearch.com/

[35] Upcoming DisplaySearch Conference to Assess Regional HDTV Market Outlook, Display Search, July 18, 2005.

[36] "The Power of Previz" by Audrey Doyle, *Computer Graphics World*, July 2002.

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Some purists argue that digital does not have the same "feel" as a movie shot on film, and our interviews reflected these varying opinions regarding shooting digitally. For example, one producer described an experience with a movie he shot in HD digital; not telling potential distributors of the technology used, he asked them for their views of image quality when discussing potential distribution with them – and all were satisfied with the quality. This producer believes that HD is the "only way" to shoot projects – and yet he is at odds with his production partners, who do not feel that the extra expense of HD is worth incurring.

While this debate over the "look" and feel" of digital capture may be a matter of personal preference more than anything, what is certain is that digital cameras have been evolving quickly and quality is improving dramatically from each generation of hardware to the next. The recently released Panavision Genesis camera is said to produce images that are "indistinguishable" from film, and one producer interviewed for this project confirmed that point of view.

Filmmakers may have any number of reasons for deciding to select one over another, including budget, creative aesthetics and production logistics, as described below in the section III (D) of this report, which is headed "Why Shoot Digitally?"

Some of the more commonly used options for digital capture are set forth below. The digital cinematography technology segment in particular is experiencing dramatic change, with the major technology providers bringing new products to market at a high pace. Of particular note are JVC's Pro HD camera, the GY-HD100U, Sony's HVR-Z1, Panasonic's HVX200 and Canon's H1. Thus, while this section aims to provide a brief overview of the technology, by the time this report is submitted the landscape may already have changed.

a) Mini-DV

Mini-DV cameras have been around for a number of years and have been used on independent and films with relatively small budgets. While a potentially viable format for some applications, this technology is still more commonly used for consumer purposes. Some filmmakers of note have indeed utilized the Mini-DV format, most notably the Canon XL series camera. The Mini-DV tape format is capable of recording images of considerable quality, but the technology is often limited by the optics of compact cameras. This was initially an SD format, although with development of the HDV format, equipment manufacturers such as JVC and Sony now manufacture cameras that can record HD on Mini DV tapes.

b) Sony CineAlta

Created in partnership between Sony and Panavision, the CineAlta[37] series of cameras are high definition video cameras geared toward motion picture production. They can

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[37] See http://www.CineAlta.com

shoot at the same 24 frames per second (24p)[38] as film and have a resolution of 1920x1080 pixels (1080p).[39] For comparison, some film scanners are capable of capturing up to 10,000 pixels horizontally from a standard 35mm frame.

CineAlta cameras (most notably the Sony HDW-F900) record onto HDCAM[40] tapes. However, the CineAlta can only record 1440 x 1080 pixel compressed component video in this mode. Episode II of the Star Wars Prequel Trilogy was shot with the CineAlta. Episode III was shot with more advanced HDW950 cameras which can record the full 1920x1080-pixel frame. When shooting in the 2.35:1 widescreen format (often referred to as "Panavision") only about 800 of the 1080 vertical pixels are actually used.

Many interviewees reported using the Sony HDW-F900 to capture digital images.

c)   Thompson Viper

The Viper FilmStream Camera[41] has the same resolution and frame rate as a high definition video camera like the CineAlta, but captures an uncompressed video image, unlike many earlier HD cameras, which applied lossy compression[42] to the video stream. The Viper has been used on high-profile, theatrically released projects.[43] One of its strengths is the capability to shoot in extremely low light levels, allowing for shooting to take place without the need for large supplemental lighting equipment.

There is currently no tape format suitable for capturing the Viper's data stream, so images are usually recorded to a hard disk array[44], including HDD, or hybrid disk drives, which are faster and more reliable than traditional hard discs. Storage of data to a disc drive allows footage to be edited immediately after it has been shot.

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[38] **24p** is a video format which runs twenty-four progressive (hence the "P") frames per second, essentially the same as film does.

[39] **1080p** is the shorthand name for a category of video modes. The number *1080* stands for 1080 lines of vertical resolution, while the letter *p* stands for progressive scan or non-interlaced. 1080p is considered to be an HDTV video mode. The term usually assumes a widescreen aspect ratio of 16:9, implying a horizontal resolution of 1920 lines and a frame resolution of 1920 x 1080 or about 2.07 million pixels. The frame rate in hertz can be either implied by the context or specified after the letter p (such as *1080p30*, meaning 30 frames per second) While 1080p is sometimes referred to in marketing materials as "True High-Definition" or "Full High-Definition", what constitutes high-definition is continually evolving over time.

[40] HDCAM is an HDTV version of Digital Betacam

[41] See http://www.thomsongrassvalley.com/products/cameras/viper/

[42] A **lossy data compression** method is one where compressing data and then decompressing it retrieves data that may well be different from the original, but is "close enough" to be useful in some way. This type of compression is used frequently on the Internet and especially in streaming media and telephony applications. The software applications used to manipulate data are typically referred to as codecs (short for "**co**mpression" and "**dec**ompression") in this context. Contrast with lossless data compression. Depending on the design of the format lossy data compression often suffers from generation loss, that is compressing and decompressing multiple times will do more damage to the data than doing it once.

[43] Notable titles include Michael Mann's "Collateral" and the upcoming "Miami Vice."

[44] A **disk array** is a business-oriented storage system which contains multiple disk drives.

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d)   Panavision Genesis

Following the lukewarm film industry response to the CineAlta, in 2004 Panavision introduced the Genesis. The Genesis produces similar 1920 x 1080 resolution images as its predecessor, but uses a single CCD45 sensor with the same width as a standard 35mm film frame. This overcomes a number of the shortcomings of small-format imagers as used in the above cameras, and also allows standard 35mm cine lenses to be used, with much the same control over depth of field as a 35mm film camera.

One producer interviewed for this project reported that she was about to use the Genesis for a forthcoming PSTC production to be filmed in Canada. She said that, prior to deciding to use the camera, she conducted extensive side-by-side comparison tests, and found the images from the Genesis to be indistinguishable from 35mm film.

e)   Dalsa Origin

Although a relative newcomer into the field of motion-picture and video equipment, Canada's Dalsa[46] is a respected manufacturer of extremely high resolution imaging systems, known for their satellite and military imaging products. The Origin uses a 4K x 2K pixel Frame Transfer CCD sensor, much larger than that of any competitor, having the same height as a 35mm film frame but more than 1.5 times its width.

Perhaps the most unique characteristic of the Origin is its dynamic range. The raw output of the camera records 16 bits per pixel with 12 f-stops of latitude on a nearly linear response curve. Like the Arri D-20, the Origin uses a rotating mirror shutter to give an optical viewfinder option, although its real purpose is to blank the CCD sensor chip during the frame readout period. The present incarnation of the Dalsa camera body is also extremely large, resembling a desktop computer.

The Origin offers several data output options including uncompressed RGB, but as of the most recent data available (November 2005) there is no provision for on-board recording, and as of this same date, no major feature projects have been shot using the camera.

f)   Television

The television industry has used digital capture technology for quite some time, and is engaged in a transition to High Definition digital technology.

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[45] A **charge-coupled device** (**CCD**) is a sensor for recording images, consisting of an integrated circuit containing an array of linked, or coupled, capacitors.

[46] See http://www.dalsa.com/dc/index.asp

g) Sony XDCAM HD

Early in 2006, Sony unveiled a new line of high-definition news acquisition products known as XDCAM HD, which is expected to replace the widely used XDCAM SD cameras. XDCAM HD and SD camcorders use the same optical media for recording, meaning there is no additional cost premium for customers to make the switch to begin acquiring HD content.

The XDCAM HD camera shoots in the HDCAM format, which is built upon the previous SD digital beta format (known also as "digibeta"). Among others, the CBC uses HDCAMS, with one studio equipped in Montreal for drama and arts production, and plans to convert additional studios in Toronto and Montreal over the next twelve months; this complements the CBC's HD mobile unit, and HD Cam field pacs.

Bob Seidel, Vice President of Advanced Technology for CBS Television suggests that because of the comparability of HD costs to SD, camera operators will likely begin to shoot in HD even though their respective station infrastructures may not yet support broadcasting in HD[47]. The CBS Television network is in the process of implementing a significant conversion to XDCAM HD technology throughout 2006-2007, suggesting that the conversion will realize significantly streamlined production workflows, allowing footage to be shot, edited and sent to air in a faster and more efficient manner.

3. Post-Production

The term "post-production" is an umbrella-term covering an array of technical and creative services necessary to complete principal photography into a final product. The post-production industry was quick to adopt digital technology as a working tool, resulting in most of the industry now being able to offer a full range of digital services.

a) Dailies

Post-production labs provide the film development, digital transfer from film to video, and video processing necessary for clients to view principal photography on a daily basis, also known as "dailies." For clients that record their productions on film, the lab processes and prints film negatives for film projection in a linear manner. Labs can also deliver dailies that are transferred from film to digital media using telecine equipment. The transfer process is technically challenging and is used to integrate various forms of audio and encode the footage with feet and frame numbers from the original film. Dailies delivered as a digital file can be processed in high definition or standard definition video and can be screened in a nonlinear manner on a variety of playback equipment.

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[47] *Broadcast Engineering*, Transition to Digital, January 22, 2006.

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b) Telecine

Telecine is the process of transferring film into video (in either analog or digital medium). During this process, a variety of parameters can be manipulated, such as color and contrast. Because the color spectrum of film and digital media are different, post-production companies often work with creative talent who utilize creative colorizing techniques, equipment and processes to enable their clients to achieve a desired visual look and feel for television commercials and music videos, as well as feature films and television shows. Some major service providers also provide live telecine services via satellite to connect their telecine artists with client offices or other affiliated post-production facilities using a secure closed network able to accurately transmit subtle color changes.

c) Digital Intermediates

Digital Intermediates (DI) service provides customers with the ability to convert film to a high resolution digital master file for color correction, creative editorial and electronic assembly of masters in other formats. If needed, the digital file can then be recorded back to film.

d) Creative Editorial

After principal photography has been completed, editors assemble the various elements into a cohesive story consistent with the creative direction provided by the Director. The post-production house provides the tools and talent required to support its clients through all stages of the editing process, beginning with the low-resolution digital images and off-line editing workstations used to create an edit decision list, through the high-resolution editorial process used to complete a final product suitable for distribution or broadcast. In addition, large post-production houses are able to offer expanded communications infrastructure to provide digital images directly from the film-to-tape transfer process to a workstation through dedicated data lines.

Most interviewees reported using post-production hardware and software produced by Avid, which comports with that companies' claim that it has become "the world leader in digital media creation tools for film, video, audio, animation, games, and broadcast professionals", and that 90% of primetime television shows, 85% of feature films, and 80% of commercials are made using one or more Avid products. Final Cut studio, maker of Final Cut Pro, an Apple Mac based editing package, was also mentioned as a popular editing suite.

e) Visual effects

Visual effects are used to enhance the viewing audience's experience by supplementing images obtained in principal photography with computer-generated imagery and graphical elements. Visual effects are typically used to create images that cannot be created by any other cost-effective means. Services are offered on an array

of graphics and animation workstations using a variety of software to accomplish unique effects, including three-dimensional animation.

f) Assembly and Formatting

The post-production house implements clients' creative decisions, including decisions regarding the integration of sound and visual effects, to assemble source material into its final form. Sophisticated computer graphics equipment is used to generate titles and character imagery and to format a given program to meet specific delivery requirements.

g) Sound Supervision, Sound Design and Sound Editorial

Highly specialized and skilled creative talent, utilizing state of the art facilities and support services are used to create sound, whether for feature films or television content. Sound supervisors ensure that all aspects of sound, dialogue, sound effects and music are properly coordinated. These services can include, but are not limited to, sound editing, sound design, sound effect libraries, ADR (automated dialogue replacement, a process for recording dialogue in sync with previously recorded picture) and Foley (non-digital sound effects).

h) Music Services

Music services are an essential component of post-production sound. Music-related services can include original music composition, music supervision, music editing, scoring/recording, temporary sound tracks, composer support and preparing music for soundtrack album release.

i) Re-recording / Mixing

Once sound editors, sound designers, composers, music editors, ADR and Foley crews have prepared the elements that will make up the finished soundtrack, the final component of the creative sound post production process is the mix (or re-recording). Mixing a film involves the process of combining multiple elements, such as tracks of sound effects, dialogue and music, to complete the final product. Mixing for major motion pictures is generally done on large mixing stages, purpose-built and provisioned with advanced recording equipment.

4. Analog, SD, and HD, and Television

It is important to note that in television there are distinctions to be made not only between analog and digital technology, but between "standard definition" and "high definition" variants of digital technology. At present, analog, standard definition (SD) digital, and high definition (HD) digital technology is in use throughout North America. These distinctions are especially relevant in the area of TV, which has made a substantial transformation to digital technology, and is again transforming, to HD technology.

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Variations between SD and HD are differentiated by 1) the number of lines in the resolution, 2) whether the format uses progressive frames (p) or interlaced fields (i)48, and 3) the number of frames or fields per second. HDTV, which is recorded in either 720p or 1080i format, is distinguished from other digital formats such as SDTV (standard definition television) and EDTV (enhance definition television) by its increased number of lines on the screen allowing for significantly enhanced picture quality.   For example, HDTV has twice the resolution of SDTV, capturing much more detail.[49]   The widescreen 16:9 aspect ratio, similar to that used for movie theatres, is another distinguishing improvement.

Although the transition from analog transmission to digital has been occurring for quite some time, the more recent evolution towards HDTV broadcasting is spawning its own revolution.   "Television in North America is going through a transition from focus on choice, the 90's story, to a focus on quality."[50]   Consumer demand for the high quality viewing experience is driving this change. Compared to analog sets (i.e. NTSC) which can display a picture with 720 tiny picture elements, or pixels, wide by 486 pixels high, for a total of 349,920 pixels, HDTV receivers have a resolution of up to 1920 x 1080 or 2,073,600 pixels, resulting in six times more pixels than analog resolution.[51]   Aside from optimal quality picture, HDTV also offers the capability of theatre-quality sound because it uses the Dolby Digital format. With picture and audio quality on the rise and prices for HDTV receivers on the decline, analysts expect by 2010 that 370 million sets will be in use worldwide.[52]   Digital television is currently being broadcast in North America over the air ("digital terrestrial television"), and via cable and satellite carriers.

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[48] "Progressive" and "Interlaced" refer to the manner in which a picture is "drawn" on the screen. Progressive technology "draws a picture" by filling in each line on a screen in order, while "Interlaced" technology "draws a picture" combining two sets of images, first a screen with all odd line filled, and second a screen with all even lines filled. Progressive scan images generally result in a higher quality image with less flicker and higher resolution.

[49] See http://www.en.wikipedia.org/wiki/High-DefinitionTelevision.html

[50] Michael McEwan – NABA AGM '04.

[51] See http://www.pbs.org/opb/crashcourse/aspect_ratio/widescreen.html

[52] "Content Undercover: DTV, HDTV and a Blip on the Horizon" by Miles Weston, DTV Professional, November 2005.

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III   Canadian Profile – Status of Digital Production

A.   The Major Players

In the realm of production and post-production, Canada has a number of small to mid-sized players in the production and post-production realms. As will be discussed in greater depth later, entities considered to be Canada's largest production companies a decade ago have since gone through extensive change, through a series of mergers and acquisitions.   Alliance Communications and Atlantis Communications are prime examples. Despite their best attempts to achieve economies of scale by merging, these production companies only experienced moderate success in the English speaking segment when attempting to compete with larger industry players.   Eventually the merged company, Alliance-Atlantis Communications, Inc., decided to disband their feature film production arm altogether, and they have focused their energies on their broadcasting properties.

In the post-production realm, the industry is also somewhat fragmented, but comprehensive, with a large number of players engaging in all aspects of post production from lab work to sound mixing. There are also multi-national players with offices in several major cities, making it easier for foreign producers to transfer post production work back to their home countries. In 2004, Technicolor purchased Toronto-based Command Post/Toybox, and became the largest post-production operation in Canada, offering one-stop shopping for all post production needs. Deluxe is another large player in the Canadian market.[53]

A majority of Canada's production occurs in Ontario, British Columbia and Quebec, comprising 90% of the $4.50 billion spent in 2004/2005. Although there have been noticeable volume fluctuations between provinces, with some increasing and others decreasing, the top three have remained constant according to data reported since 1997.[54]

Until now that had been sufficient to attract enough business to satisfy interested parties; however, with the production trend declining, Canada's industry is responding with some decisive and bold moves. Toronto Film Studios' Filmport is expected to begin construction during the summer of 2006. This project aims to be Canada's version of the traditional Hollywood-type studio facilities. "The city has always been successful at attracting films and shows in the $2-$10 million dollar range, but for anything bigger than that, producers found that Toronto just didn't have the capacity to accommodate them. But Filmport is designed to go after blockbusters in the $100-$150 million dollar range." Lofty plans for this studio include a 45-acre site, east of the downtown core, which will include corporate offices for film producers, postproduction and animation firms, union and guild offices, entertainment legal and accounting firms, payroll,

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[53] "Technicolor, Toronto Style" by Scott Lahane, *Below the Line News*, January 2006.

[54] *Profile 2006*, An Economic Report on the Canadian Film and Television Production Industry, Canadian Film and Television Production Association, (exhibit 9).

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casting and talent agencies, advertising and production companies and other film and media entities. Phase one is expected to comprise six sound studios plus and additional 110,000 square feet of production-support space, and slated to eventually grow to 14 state-of-the art sound stages.[55]

Based upon a review of publicly available information for production and post-production companies and the services they offer, it appears that the Canadian post-production industry has made significant strides towards preparing for digital conversion. In this sense, Canada's highly fragmented production structure appears to allow for a high degree of flexibility and adaptability.[56] Specifically, for the purposes of this study, service offering profiles were reviewed for 164 post-production companies within various service segments. Of the 164 profiles analyzed, 101 profiles (61.6%) show evidence of the service companies offering significant competency in digital post-production. 52 profiles (31.7%) contained insufficient or inconclusive data – and only 11 companies (6.7%) appeared to offer no significant digital competency or services. The companies reviewed offer a full range of post-production services and are structured as small stand alone-companies, to large integrated companies, providing services including labs; film & video post; sound post; animation; effects; colour correction; and duplication and conversion/transfer.

B. Production Profile - Overall Volumes

Production volume statistics were compiled from the Canadian Film and Television Production Association's (CFTPA) Profile 2006: An Economic Report on the Canadian Film and Television Production Industry, as well as from data compiled by the Canadian Audio-Visual Certification Office (CAVCO). Total production volume for 2004/2005 came in at $4.50 billion, comprised of domestic features, domestic television, foreign location, and in-house broadcast productions, representing a 9% drop from the prior year, and an 11.4% drop since 02/03. For 2004/2005, production consisted of $1.69 billion in Canadian television production, $253 million in Canadian feature film production, $1.46 billion in foreign location production, and $1.09 billion in broadcaster in-house production.

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[55] "Toronto: The Talk of the Town", *Below the Line News*, January 2006.

[56] *Ontario Production Guide 2005-2006.*
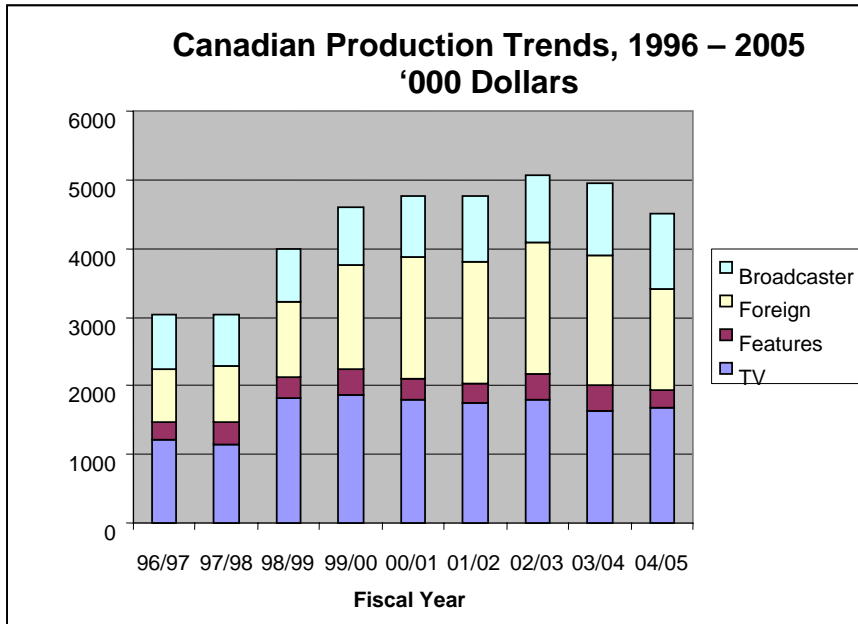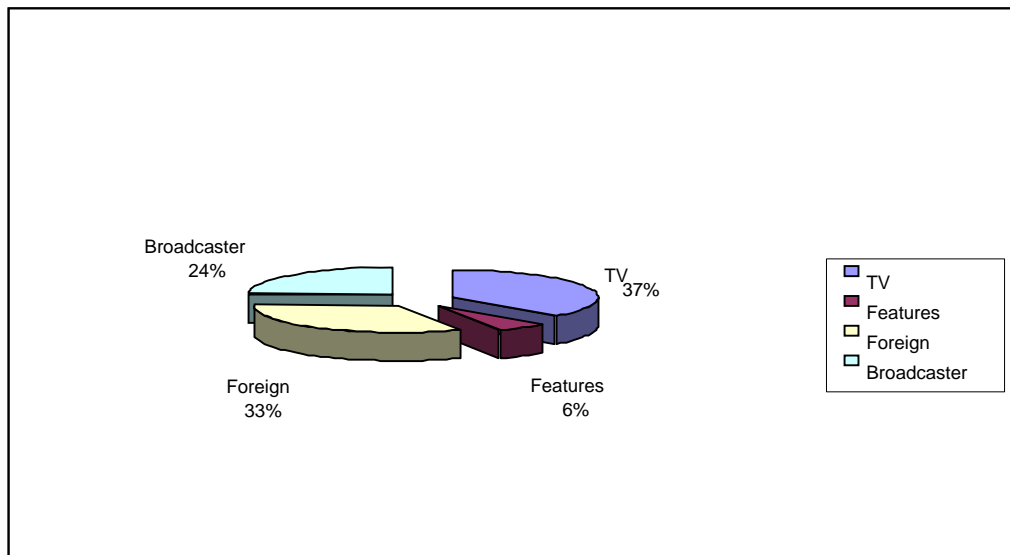
Figure 1
Canadian Production Trends, 1996-2005 [57]

Figure 2
Production in Canada, 2004/2005, by Type [58]

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[57] From *Profile 2006*, CFTPA et al.

[58] From *Profile 2006*, CFTPA et al.

1. Television Production

Total Canadian television production increased by 3% in 2004/2005 to $1.69 billion, accounting for an estimated 8,373 hours of original television programming, with the increase largely attributable to an increase in the volume of fiction programming.

2. Broadcaster In-House Production

In-House production by Canadian Broadcasters amounted to $517 million for the 2004/2005 broadcasting year, up 7%, with the increase attributable to increased spending by Canadian specialty services.

3. Theatrical Production

Feature film production in Canada was $253 million in 2004/2005, a total of 116 features, down from $369 million, and 127, respectively, in 2003/2004.

4. Foreign Location Production

Foreign location production in Canada, both film and television, accounted for $1.46 billion in 2004/2005, down 23% from the prior year.

C. Production Profile – Canada's Digital Production

In an effort to measure digital production, we examined published reports, asked interviewees for their opinions, asked trade organizations for data, and contacted the Canadian Audio-Visual Certification Office (CAVCO), Canadian Television Fund (CTF), Telefilm Canada (or "TFC", which was contacted in its capacity as administrator of the Canada Feature Film Fund, or CFFF), and the Canadian Independent Film and Video Fund (CIFVF). We learned that there are no definitive published reports available on overall volumes of digital production in Canada. Interviewees expressed a wide variety of opinions regarding the amounts of digital production, which were at times contradictory. Trade organizations either provided informal estimates, or relied upon data from other sources.

Thus, we focused our effort on CAVCO, CTF, TFC, and CIFVF, each of which had data available and provided statistics for this project in a timely fashion. We also interviewed an executive at the National Film Board, who noted that they have been producing in all-digital format since 1996, and are currently producing in high definition. However, despite the amount of available data, it is not sufficiently useful to draw deep and meaningful conclusions about digital production in Canada, as further discussed below. As a result, we have created a composite picture of digital production, which is drawn from a variety of sources.

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1. Composition of Production

a) Feature Film

Feature film in Canada is still largely being shot on film, post produced in a digital format, and delivered in a combination of digital and analog formats. According to data from CAVCO, 93% of foreign service production features are produced on film, vs. 82% of Canadian feature film, while 84% of foreign service features were delivered on film, vs. 82% of Canadian features.[59]

According to data from TFC, 77% of applicants to the CFFF shot their works on film; 71% of English language productions, and 85% of French language productions.[60]

Thus, we conclude that approximately 80% of Canadian feature films are shot on film, with more French language features being shot on film than English language films, and both English and French language films being shot on film at a rate below that of foreign service productions.

Using this estimate, approximately 23 Canadian feature films were shot digitally in 2004/2005, or 20% of the 116 features that the CFTPA reports as having been produced in 2004/2005.

b) Television

According to data supplied by the CTF, 42.2% of programming funded by the CTF was shot in an analog format, 51.5% in SD Digital, and 6.2% in HD digital. French language programming was more likely to be filmed in SD digital, and less likely to be filmed in HD or analog: 55.2% of French language programming was captured in SD, vs. 46.1% of English language programming. HD was proportionately more expensive than SD, accounting for 6.16% of shooting hours, but 11.3% of shooting budgets.

We conclude from all sources that approximately 5-10% of Canadian television production is being shot on HD, with approximately 50% shot in SD. Based upon CFTPA's estimates of 8,373 total hours Canadian television production, in 2004/2005 418 – 837 hours of television were shot in HD, and 4,187 hours were shot in SD.

According to CAVCO data, Canadian certified television productions are much more likely to be shot on tape (79% of which were shot on tape) than are certified PSTC television productions (14% of which were shot on tape). We thus conclude that Canadian Television programs are more likely to be shot in SD digital than are foreign service productions.

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[59] Data supplied by CAVCO covered the period 1996-present for CPTC productions, and 1997-present for PSTC productions, a total of 10,594 productions of all types.

[60] CFFF data covered applicants for the three year period 2002-2003 thru 2004-2005, a total of 109 feature films.

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c) Other Programming

Based upon interviews, as well as data supplied by the CIFVF, we believe that (a) documentaries are being shot almost exclusively in digital, largely SD, and (b) nature programs are being shot almost exclusively on HD.

A detailed discussion of this data, and data sources, follows.

2. Data and Data Sources

a) Trade Associations

The CTFPA publishes numbers on overall production, as well as numbers regarding high definition production and costs. The CFTPA's numbers on high definition are supplied by the CTF, and thus we contacted the CTF directly.

b) Interviews

Interviews conducted with industry professionals elicited a wide range of opinions with respect to shooting in digital and HD. For example, feature film professionals would remark that the digital transition in feature film was taking place in fits and starts (quickly in post-production, mastering, and delivery, less quickly in capture), yet they felt that television production had largely moved to digital and HD. In fact, interviews with television professionals revealed that in some cases material which was presumably shot in HD – since it was being telecast in HD – was being captured on film, converted to digital for all post work, and then mastered both on a traditional and high definition digital master. Generally, industry experts concluded that somewhere between 5%-10% of all Canadian television production is being made available in HD, and this estimate coincided with data available from the CTF.

One consistency that emerged from interviews was that industry professionals felt that there is a correlation between budget size and the use of digital technology – that lower budget productions are more likely to shoot in SD digital, while higher budget productions are more likely to be shot on film or HD digital, the notable exception being nature programs, which have largely moved to HD digital. One producer said "I believe that all low budget features are being shot on HD, while middle budget and over is primarily being shot on film."

c) Primary Data

Given the limited utility of trade association and interview data, we especially focused on information provided by CAVCO, CTF, TFC, and CIFVF. While not all of these organizations routinely publish data on technical formats, application forms used by these bodies require applicants to provide technical format data when seeking certification or funding from these entities. The Canadian Independent Film and Video Fund, the Canadian Audio-Visual Certification Office, the Canada Feature Film Fund (administered by TFC), and the Canadian Television Fund all require applicants

to provide information about the formats in which works are either shot, post-produced, mastered, or delivered. Thus, not only could the databases of these organizations yield information specific to formats, but if tabulated in conjunction with other applicant data, these databases could yield a rich analytic framework with which to understand the usage of technology within Canada's audio-visual sector.

However, due to the manner in which the data is collected, the utility of that data is, in practical terms, marginal. The various entities requesting data do not collect it in any uniform manner. More critically, the open-ended nature of the question format used in some cases, coupled with broad response fields, renders the information inconsistent and vague. For example, respondents overwhelmingly indicated to CAVCO that they had worked in a "Tape" format, without specifying whether the information on that tape was analog, SD digital, or HD digital.

Table 1 shows the various organizations, data collected, and response fields.

Table 1
Technical Format Data Sought by Organization and Type

Organization	Application	Section	Info. Sought	Fields
CIFVF	App. for Film and Video Projects	Page 2	- Shooting Format; - Mastering Format	-Betacam SP -DV Cam -Digital Beta -Other ("Specify")
CFFF	App. for Production Financing	Page 2	- Shooting Format; - Delivery Format	- Film (Gauge) - Video ("Specify")
CTF	App. for TV Production	Page 1	- Shooting Format; - Delivery Format	- Shooting Format - Delivery Format
CAVCO	App. for Tax Credit	Page 3	- Production Format; - Post Production Format; - Delivery Format	- Film - Tape - Other

We contacted each of these sources and obtained primary data to determine what might be learned regarding volumes of digital production in Canada.

i)   Canadian Audio-Visual Certification Office

The data from CAVCO was the most representative of the information sources, encompassing both feature film and television, 1,036 works for 2004/2005, vs. 164 works covered by the CIFVF for approximately the same period. CAVCO applicants are asked to specify their format by indicating if the format is a "Film" or "Tape" format. Since "Tape" can contain analog, standard digital, or high definition digital data, those respondents who report producing, post-producing, or delivering on "tape" provide information that cannot be used to assess whether they are utilizing SD digital,

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HD digital, or analog formats, and it is not practical to retrospectively contact the applicant pool and try to obtain this data from each of the 1,000+ applicants.

We nonetheless examined CAVCO data for the period 1996/1997 – present, including fiscal year, genre, category, primary market, language, production format, post format, and delivery format, a total of 73,024 data points for 9,127 applications. The overwhelming response of applicants seeking certification under the Canadian Film or Video Production Tax Credit (CPTC) responded that they utilized a "Tape" format. For the period examined, 73% of applicants indicated that their work was shot on "Tape", with 84% reporting that they post-produced and delivered their work on "Tape", as shown below in Charts 4 – 6.

We also examined CAVCO supplied data for Film or Video Production Services Tax Credit (PSTC) applications. As shown below in Tables 7 - 9, these productions were overwhelmingly (85%) shot on film, with post production and delivery split nearly equally between film and tape. It can be concluded that overall, PSTC productions are more than four times likely to be shot on film than are CPTC productions. However, when broken down by segment, 93% of PSTC feature films are captured on film, compared to 82% of CPTC feature productions, and 95% of PSTC television productions are shot on film, whereas only 12% of CPTC television productions are shot on film. Thus, Canadian feature films are being shot on film at approximately the same rate as foreign service productions, but Canadian television programs are much less likely to be shot on film than foreign service production.

Several factors may account for the disparity in television format. First, PSTC production may be relatively larger budget productions – relative to the general population of television productions, and relative to Canadian productions. Larger budget productions tend to utilize more expensive technology, such as 35mm film. Second, the sample sizes were disparate – 8,303 programs in the sample for Canadian shows, vs. 984 for foreign shows. It may be that, if a sample of similar size were to be taken of foreign television programs, a higher percentage would be shown to have been shot on tape.

Table 2
CAVCO Data, Comparison of Applicants Self Reported Formats, 1996-97-98 – Present

Format	Production		Post		Delivery	
	CPTC	PSTC	CPTC	PSTC	CPTC	PSTC
Film	19%	85%	7%	45%	9%	45%
Analog Tape	2%	0%	2%	0%	2%	0%
Digital	2%	2%	3%	3%	2%	2%
HD	1%	0%	1%	0%	1%	0%
Tape	73%	10%	84%	49%	84%	50%
Other	3%	3%	3%	3%	2%	3%

Figure 4
CPTC Applicants Self-Reported Production Format, 1996-97 – Present
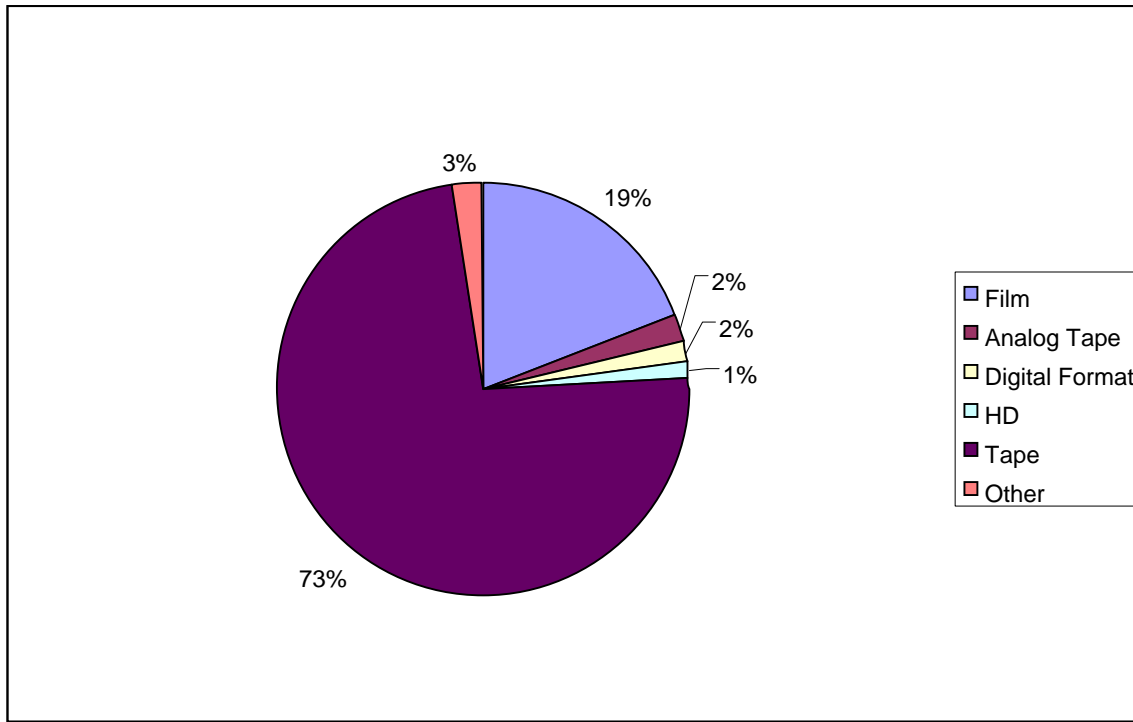
Figure 5
CPTC Applicants Self-Reported Post Format, 1996-97 – Present

Figure 6
CPTC Applicants, Self-Reported Delivery Format, 1996-97 – Present

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Figure 7
PSTC Applicants Self-Reported Production Format, 1997-98 – Present

Figure 8
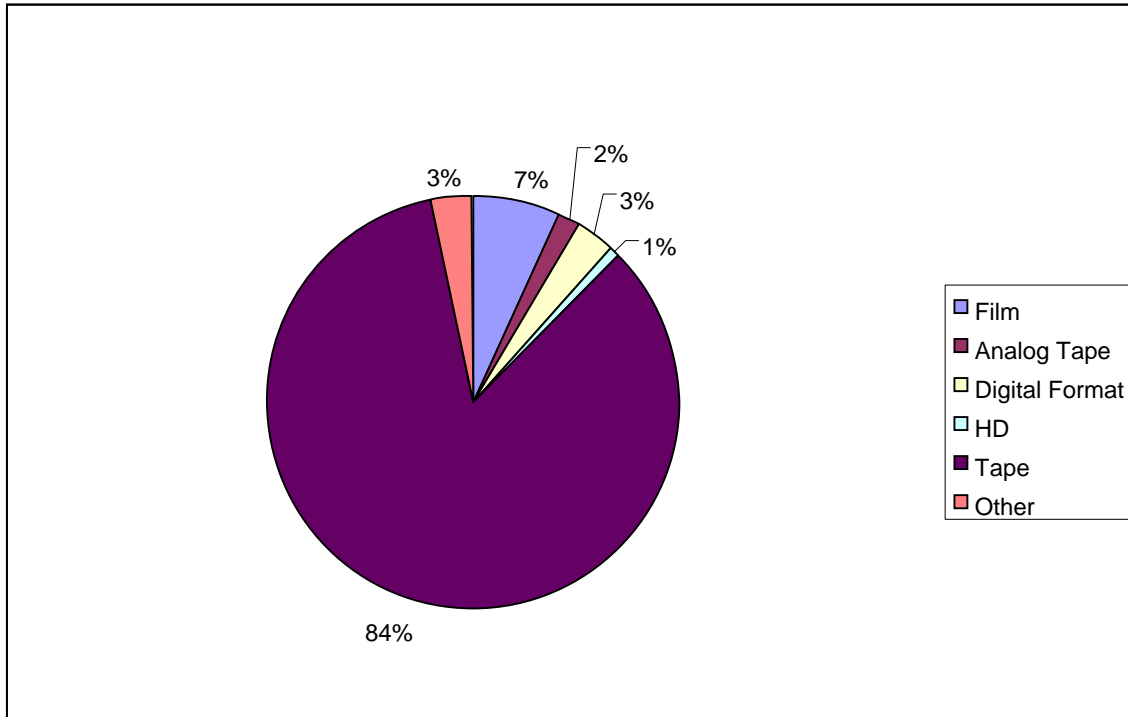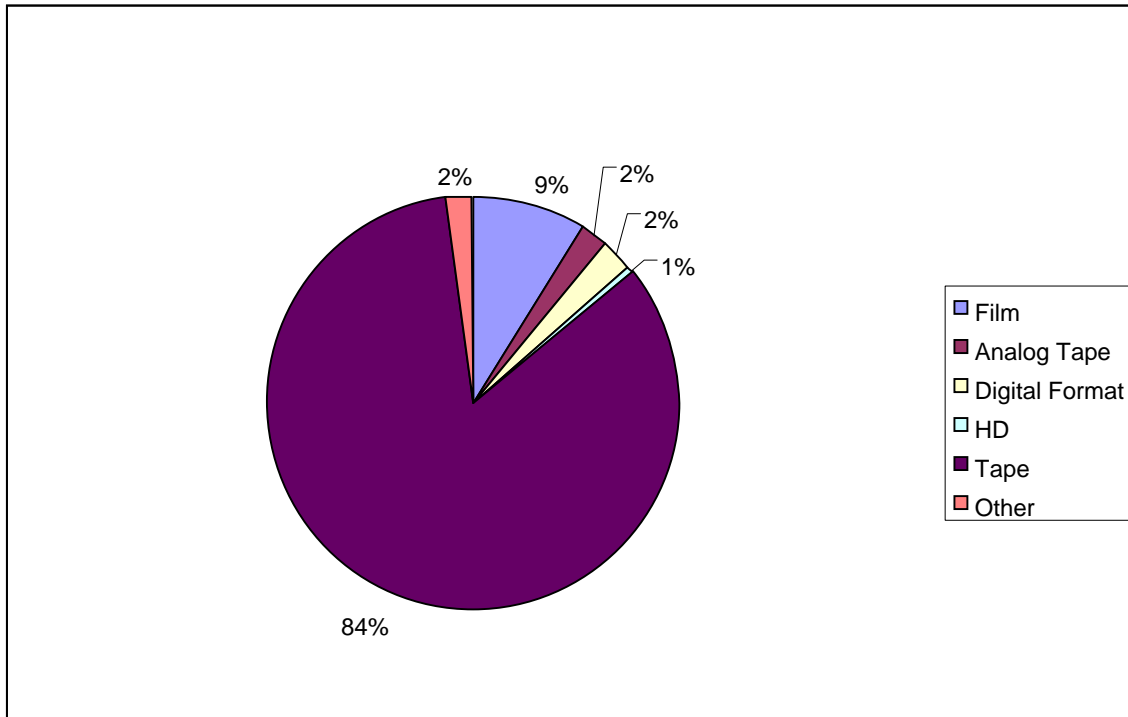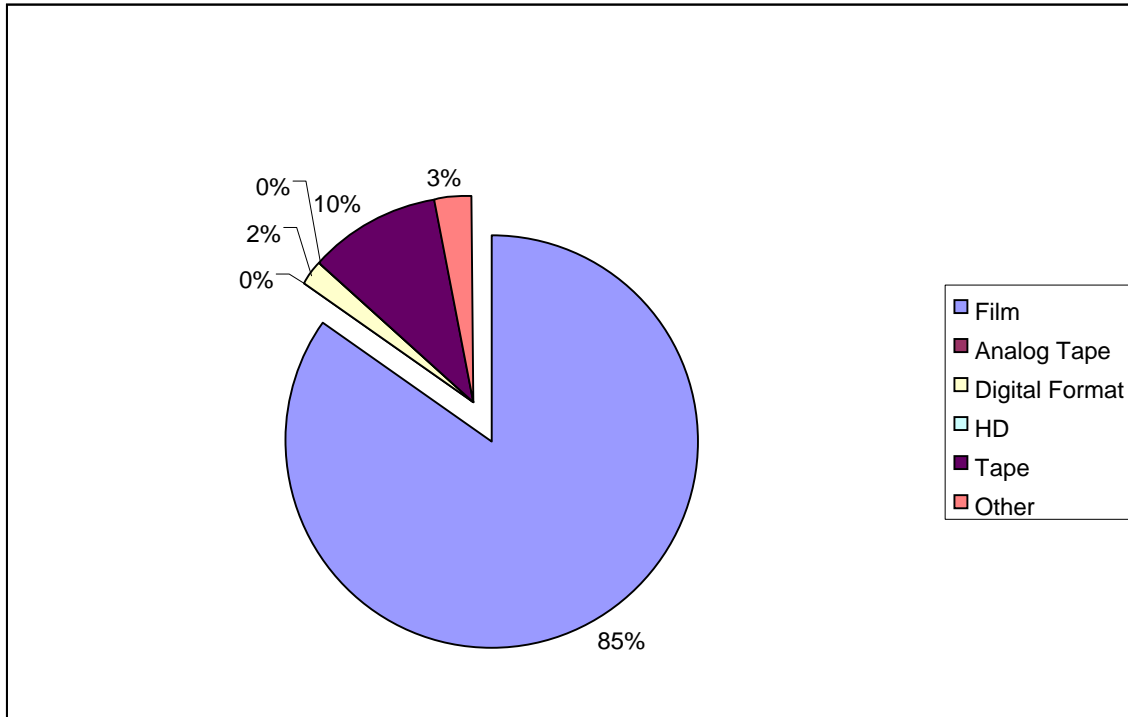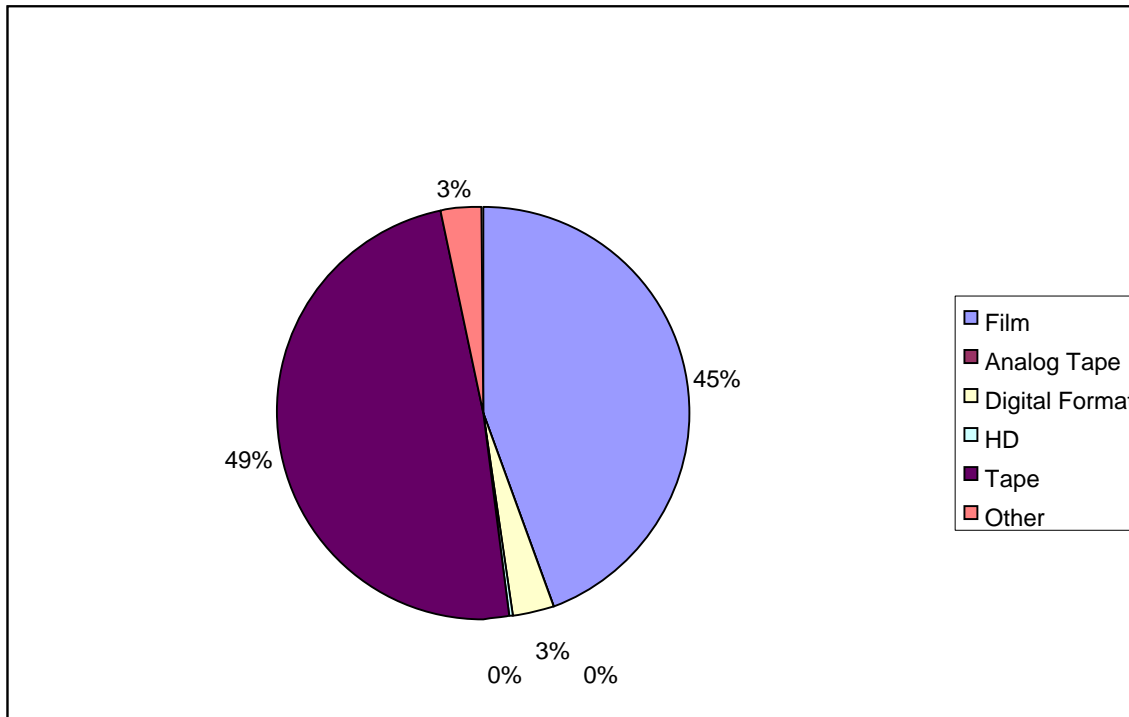**PSTC Applicants Self Reported Post Format, 1997-98 – Present**

Figure 9
PSTC Applicants Self Reported Delivery Format, 1997-98 – Present
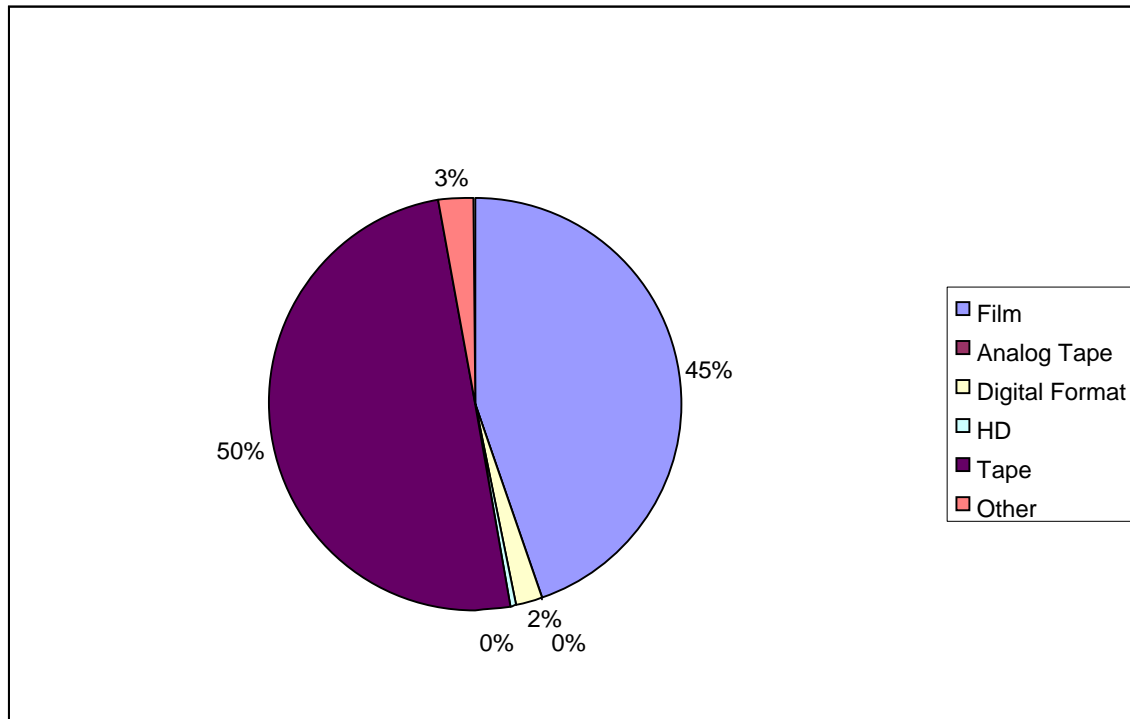
ii)   *Canadian Television Fund*

In an October, 2005 report submitted jointly by the CFTPA and Canadian Digital Television to PCH, it was stated that "Based upon CTF data, between 02-03 and 04-05, on average only 5% of the total hours supported (by the CTF) was produced in HD." The CFTPA's 2006 Industry profile reports that the CTF supported 139.2 hours of English language HD in 2004/2005, up 43.2 hours from 2003/2004, and 70.9 hours of French language HD programming in 2004/2005, up 16.9 hours in 2003/2004.[61]

Although these numbers are at variance with numbers provided directly to us by the CTF, the percentages are similar. CTF statistics provided for this report indicate that 6.2% of CTF supported programming was shot in HD. This percentage was echoed in interviews – that roughly 5% of television production is occurring in HD.

CTF directly provided data to us which broke down CTF supported production into SD digital, HD digital, and analog groupings (noting that there may be some overlap between the groups), and provided information for both budgets and hours for production and delivery formats.

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[61] "Canadian Content HDTV Strategy", Presented to Jean-Pierre Blais, PCH, October 18, 2005, by CFTPA and Canadian Digital Television.

An analysis of this data indicates that 57.6% of CTF supported programming, or 1,328.9 hours was shot in SD digital or HD, while 59% of CTF supported programming, or 1,360 hours, was delivered in SD or HD. HD was proportionately more expensive than SD, accounting for 6.16% of shooting hours, but 11.3% of shooting budgets, and HD production was almost equally prevalent in English and French, approximately 70 hours in each language.

Table 3
CTF Supported Production, Technical Formats, 2004/2005

Hours and Budget by Language (Hours; $ Millions)

	SD			HD			Analog			Total
	English(E)	French(F)	E + F	English	French	E+F	English	French	E+F	
Shooting Hours	436.9	749.8	1,186.7	69.7	72.5	142.2	440.5	536.8	977.3	2,306.2
% of Total	18.9%	32.5%	51.45%	3.0%	3.14%	6.16%	19.1%	23.3%	42.4%	100%
% of Category	36.8%	63.2%	100%	49%	51%	100%	45.1%	54.9%	100%	-----
Delivery Hours	561.5	723.0	1,284.5	62.0	14.0	76	322.5	622.1	944.6	2305.1
% of Total	24.4%	31.4%	55.7%	27.0%	.6%	3.4%	14.0%	27.0%	41.0%	100%
% 0f Category	43.7%	56.3%	100%	81.6%	18.4%	100%	34.1%	65.9%	100%	----
Shooting Budget	$175.1	$125.2	$300.3	$44.6	$37.6	$82.2	$259.7	$86.3	$346	$728.5
% of Total	24.0%	17.2%	41.2%	61.2%	5.2%	11.3%	36.0%	11.8%	47.5%	100%
% of Category	58.3%	41.7%	100%	54.2%	45.8%	100%	75.0%	25.0%	100%	----
Delivery Budget	$307.3	$158.6	$465.9	$67.3	$10.9	$78.2	$104.9	$80.5	$185.4	$729.5
% of Total	42.1%	$21.2%	63.9%	9.2%	1.2%	10.7%	14.4%	11.03%	25.4%	100%
% of Category	67.0%	33.0%	100%	86.0%	14.0%	100%	56.6%	43.4%	100%	

iii) *Canada Feature Film Fund*

CFFF funded a total of 28 feature films in 2004-2005, during a period in which the CFTPA reported that a total of 116 Canadian feature films were produced, including those produced under coproduction treaties.[62] Of CFFF funded films, 23, or 82%, were shot on film (tracking the percentage derived from CAVCO data), and only 2 were shot in HD, as shown below in Table 4.[63]

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[62] CFFF data supplied in a spreadsheet from Telefilm Canada; CFTPA/APFTQ data from *Profile 2006*.
[63] Format for 2 of the 28 productions was not available.

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Table 4
CFFF Financed Feature Film Productions, Production and Delivery Formats:
Number of Productions, 2004-05

	SD Digital	HD Digital	Analog	Unknown	Total
Production Format					
English	0	2	14	1	17
French	1	0	9	1	11
Total	1	2	23	2	28
Delivery Format					
English	0	0	13	4	17
French	0	0	10	1	11
Total	0	0	23	5	28

Table 5
CFFF Financed Feature Film Productions, Production and Delivery Formats, By
Percentage, 2004/05

	SD Digital	HD Digital	Analog	Unknown	Total
Production Format					
English	0	12%	82%	6%	100%
French	9%	0	82%	9%	100%
Total	4%	7%	82%	7%	100%
Delivery Format					
English	0	0	77%	24%	100%
French	0	0	90%	9%	100%
Total	0	0	82%	18%	100%

iv) *Canadian Independent Film and Video Fund*

At our request, the CIFVF reviewed a sample of approximately 50% of applications received requesting support for the period ending March, 2005. Applicants were overwhelmingly using digital formats for capture – just under 90% of applicants used digital capture, vs. analog. At the same time, very few productions were captured in

HD – only 3 of 80, or 3.75%. Non theatrical productions of the type supported by the CIFVF tend to have lower budgets than do feature film or television projects which are intended for commercial release, leading to the conclusion that SD digital capture is a very cost-effective way to produce.

Table 6
Production and Master Formats, Canada Independent Film and Video Fund Applicants [64]

Format	Capture Format, No. of Productions	%	Master Format, No. of Productions	%
Digital		**88.75%**		**66.25%**
DVCam	47		10	
Digital Betacam	12		36	
HD	3		1	
24 FPS Digital Video	1			
DV50	1			
DVC-Pro	1			
Mini-DV	4			
Digital Animation	2			
HHD			1	
DVD			5	
Analog		**8.75%**		**30%**
35mm			1	
16mm	2			
Betacam SP	5		23	
MIXED				
HD & Film	1			
DV & 16MM	1	**2.5%**		
Unknown			3	**3.75%**
Total	80	100%		100%

D.   Why Shoot Digitally? Perceptions and Experiences

Interviewees cited a number of factors in describing the reasons for shooting digitally, which included (1) Familiarity, (2) Aesthetics, (3) "Future-proofing," (4) Market demands, (5) Shooting conditions, (6) Repurposing, and (7) Cost.

Familiarity – A number of producers and directors stated that general familiarity with digital technology was a starting point in reaching a decision with respect to which technology to use. As with many new technologies, becoming acquainted with digital technology was described as

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[64] From a sample of 80 applications to the CIFVF for the period closing in March, 2005, of a total of 164 submitted. While these categories of format may not all be mutually exclusive, they are shown as self-reported by applicants.

being time consuming. Simply put, the more familiar that a producer or director was with digital technology, the more likely she was to embrace it for a subsequent shoot. This "chicken and egg" situation adds emphasis for the need for professional training to help start the cycle of using digital technology.

Aesthetics – As one producer put it, "eventually digital cameras will be able to do anything that a film camera can." One producer, for example, described wanting to create a "more classic" look for a production, and felt that digital technology could not convey that "classic" look, "milkier, more nostalgic." Interviewees spoke in subjective terms about the need for digital cameras to be able to capture nuances of shadow, highlights of light, and the need to be able to work in low ambient light conditions as adequately as has been possible with film stock. Another producer described a planned production, describing it as a story of historical dimensions, and suggesting that she would be choosing to shoot on film to capture the "look and feel of an epic", the grandeur of the story. One producer, with experience primarily in larger budget service production, was preparing to shoot a feature film when interviewed. "We are going to use the Panavision Genesis camera, the first major feature film to be shot in digital with this camera. We tested it extensively, and found that we could not tell the difference between images captured on 35mm, and images captured with this camera." This point of view was echoed by a producer who said that several years ago he shot a feature film in HD, and sent it to potential distributors without informing them that it had been shot in HD. None commented on the look or feel of the film – in fact, all were happy with it.

At the other extreme, producers spoke of shooting in digital formats to capture an "edgier", "more modern" look for productions which, thematically, required such a look. And, there is a line of thought that the issue with aesthetics is not that HD is less capable than film, but that it is actually *more* capable – that it offers greater capabilities which look different than film, and which cameramen and directors have yet to learn to control. While some producers maintain that digital technology doesn't capture nuances in lighting, others believe that it is actually more light sensitive, for example, facilitating the shooting of exteriors at night by reducing the amount of equipment required to light a façade.

 "Future-proofing" – Interviewees all had one eye on the future, wishing for their works to have a "shelf life" that would not be cut short by changing technology. As one producer put it, "We are licensing our work throughout the world, and hope that people will be watching it well into the future. By making it available on HD, we stand a better chance of being part of the future." This "future-proofing" was also seen as a way to facilitate repurposing of content as opportunities arise; see below.

Market demands – One producer said "nature programs have to be shot in HD if you want to sell them internationally" - the subject matter and audience demanding a vividness, a fidelity, that can only be achieved through high definition, and as a result, international broadcasters are unwilling to license programs that are not offered in HD. Several French-language interviewees stated more broadly, "broadcasters are increasingly demanding that content be shot in HD."

Shooting conditions – This was mentioned by one producer. In short, production taking place outside in the weather, under harsh conditions in an industrial location, or under other circumstances which might impact delicate machinery would lend itself to more traditional film-based technology, "more tried and true under the circumstances."

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Repurposing opportunities arise with digital content – More of an ancillary factor than part of the decision making process, digital content can be more easily repurposed for alternative delivery methods. Since content captured in an analog format can be (and usually is) converted to a digital format, and these opportunities are still emerging, this is not a major factor in deciding to produce digitally. There are two general ways in which content is being repurposed: (a) for promotional use, and (b) for delivery consumers using new platforms.

Many producers are using digital technology for the promotion of their feature film and television programs – placing trailers online, sponsoring contests, or creating specific web sites to build awareness and interest in a film. This type of use is most highly evolved in the area of television, where the longer life of television or broadcast properties allows for a more significant investment in a branded or promotional site. In some cases, very little repurposing of content is necessary – an existing trailer, for example, may simply be made available for download. In other cases, new content is created. Examples of promoting existing properties through the creation of new content attached to rich media sites include what has been done by Epitome productions (DeGrassi) and YTV with their web sites. The DeGrassi web site offers fans of the television show an opportunity to participate in an online community, to register with the Degrassi Community School, receive a virtual homeroom assignment and a virtual locker, and to learn about Degrassi stories prior to broadcast.[65] YTV's web site offers program information, games, show clips, and promotional materials tied to YTV's broadcasts, similarly creating a platform to extend YTV's brand and maintain fanbase loyalty.[66] In both cases, these sites tie back to, and reinforce, the underlying broadcast properties.

Bell Canada, on the other hand, represents a platform from which existing content can be put to consumers in new ways, and offers subscribers a variety of programming from suppliers such as Much Music and the CBC, which can be streamed or downloaded, essentially pre-existing programming which may be edited, but is essentially unchanged from that previously broadcast.

Producers are struggling to understand these opportunities as business models are emerging, with advertising support, subscriptions, pay-per use, and pay for limited time use all compete.

E. Cost Assessment – Digital vs. Analog

1. Many Points of View

Our investigation into the costs of digital technology was a vivid reminder of the producer's adage that "every project is different." Personal experience, the way in which technology is used, and the particular circumstances of individual productions all influenced responses to questions about costs. Costs were cited over and again by interviewees as a factor in using digital and high definition technology, but there were few points of agreement beyond the fact that cost is a consideration, as more fully described below. One feature film producer said that shooting in HD is actually cheaper than shooting on film, while other producers believe that shooting in HD is roughly equivalent to the cost of shooting in 35mm. In fact, all of these views are accurate, depending upon the nature of the projects under discussion.

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[65] http://www.degrassi.tv/index.jsp

[66] See http://www.ytv.com/

Personal experience of interviewees at times resulted in dissimilar points of view. For example, several interviewees expressed the view that digital post production, because of the relative speed offered by the technology compared to analog post production, is more cost-effective than analog post. On the other hand, several interviewees felt that analog post-production, because it is a relatively slow process, requires a discipline that leads to cost containment, that producers find it easier to hold costs down in an analog environment due to the discipline and planning required, and that as a result digital post tends to be more expensive.

Another challenge in assessing the costs of adopting digital technology is the various permutations in which digital technology may be adopted. If a television producer with existing sets wished to convert from SD to HD, she could be required to reconstruct sets, adopt new makeup and lighting techniques, and create a new wardrobe; the costs of adopting HD technology would be directly related to these costs, which would themselves vary according to the specific requirements of a particular production. Alternatively, a producer might adopt HD technology by capturing in film and simply converting that film to HD, then delivering HD to end users. In fact, interviewees for this project described integrating HD into the production flow in various ways – some shooting in Super 16mm and then post producing in HD; another, shooting and posting in standard definition digital, and then mastering to HD, a third shooting on 35mm, posting in digital, and then mastering both in HD and SD, and a fourth capturing in digital, posting in digital, and outputting to film.

Most interviewees were reluctant to make general cost comparisons, and those that did felt that their own experiences were unique and not generally applicable to other situations. Several producers stressed that their cost structures were singular because of either their location, their ability to negotiate with vendors, or an eagerness on the part of vendors to encourage the use of a new technology in which they had invested.

2.   Why are HD Costs Higher?

Those who believe that shooting in HD increases costs argue that the cost increases come from three primary sources: equipment rental, post production, and physical, or "on screen" elements of production. With respect to equipment rental, "the equipment is still somewhat scarce, still somewhat new, and thus rental companies can and do charge a premium", which was estimated as adding a cost differential of approximately 3% to an overall budget as compared to SD.

With respect to post production, tape stock for HD is said to be up to five times as expensive as SD tape stock; furthermore, as HD involves handling exponentially more digital information than SD, processing HD can take longer, leading to longer post production times and higher costs, estimated as being up to twice as expensive as SD post production.

Finally, the higher fidelity of HD can in certain circumstances require producers to put more money "on the screen", creating new sets, and spending more on wardrobe, makeup, hair styling, and other on screen elements.

3. Why are HD Costs Lower?

Those who held the view that HD production costs cited several factors. First, shooting in HD can save time on the set, resulting in cost savings. The Director of Photography can "see what he gets", playing it back instantly, eliminating some of the retakes he would otherwise shoot, as well as magazine changes, and other time spent handling film. This saving will increase as HD takes increasing advantage of capture to disc. Second, most post-production is done digitally; shooting on film requires a conversion to digital for post production. HD capture eliminates the cost of processing and converting film stock.

As we noted above, one consistency that emerged from interviews was that industry professionals felt that there is a correlation between budget size and the use of digital technology – that lower budget productions are more likely to shoot in SD digital, while higher budget productions are more likely to be shot on film or HD digital, the notable exception being nature programs, which have largely moved to HD digital. One producer put it this way: "I believe that all low budget features are being shot on HD, while middle budget and over is primarily being shot on film."

4. What are the Cost Differentials?

For the same reasons cited above regarding the collection of production volume data by format, it is impossible to definitively determine average costs of HD production for comparative purposes to non-HD production. Furthermore, while published data on the costs of HD production is available, it is not informative. The CFTPA has published data obtained from the CTF comparing Canadian television producers' production costs for SD and HD. The CFTPA's 2006 Industry Profile states that "The CTF found that CTF-supported English-language drama programming shot in high definition cost, on average, 40% more than CTF-supported standard-definition programming." The CFTPA 2006 Profile shows that, in the case of one hour English language drama programs, the average production cost for standard definition programs is $1.16 million, vs. $1.60 million for HD, a difference of 38%, with even higher differentials in other genres of programming:

Table 7
Cost differential, CTF-supported high-definition television vs. standard definition, as a percentage of standard definition cost [67]

Genre	English	French
Drama	+ 40%	+ 85%
Documentary	+ 75%	+ 243%
Children's	+ 40%	+ n/a
Variety	+ 184%	+ 477%

Based upon our research and interviews, we believe that the cost of producing HD television ranges from 10%-15% more than the cost of producing television in SD. In fact, interviews

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[67] From the *CFTPA 2006 Industry Profile*, page 36.

with CFTPA and CTF executives confirmed that some portion of the cost increase cited in their statistics is most likely attributable to the use of HD technology, while another portion is likely attributable to the nature of the productions themselves – in other words, higher budget productions may be more likely to be the early adopters of HD technology. Thus, it cannot be inferred from the CTF/CFTPA numbers that the cited cost differentials – for example, 40% higher costs for English HD drama – are solely attributable to the cost of shooting in HD.

a)   35mm and HD

In arriving at a cost comparison, a series of widely divergent variables need to be assessed. A general rule of thumb expressed several times was that, compared to shooting in 35mm, there are few additional costs incurred by shooting in HD, because film stock/tape stock, equipment, post, and set costs are comparable – sets constructed for use in a 35mm production would have to be built to same level of "quality", or visual integrity, as sets for an HD production. Another view expressed was that "there is maybe a 5% premium to shoot in HD vs. shooting in 35mm."

A similar assessment was made with respect to shooting in 35mm and then converting to HD: "shooting in 35mm and converting to HD for post production will cost you nothing (additional)". Another producer estimated that it would cost app. 5% to master in HD versus SD, but stressed that this estimate was likely to be low as the producer had obtained favourable consideration from a vendor.

b)   16mm/SD and HD

Cost differentials were cited as being greater with respect to shooting in HD vs. the cost of shooting in SD or 16mm. "…it could cost 10 – 15% more to shoot in HD vs. 16mm or SD" said one producer. Another producer quoted numbers for producing in SD, then generating an HD master, as approximately 3.5% more.

c)   Lower budget preferences

Interviews did suggest that there is a direct relationship between the size of a production budget and the use of digital technology in that lower budget productions are more likely to use digital capture technology than higher budget productions. Since documentaries, nature programs, and made for television programs tend to have lower budgets than feature films, this suggests that those types of productions are more likely to use digital technology, in large part SD technology (though nature programs are moving to HD.)

A review of data made available by the Canadian Independent Film and Video Fund for approximately half of the applicants for funding for the period ending March, 2005 can be interpreted as supporting this view of interviewees. Of the 80 CIFVF applications for non-theatrical, video, and new media works reviewed for this study, 89% were captured digitally, and 67% were mastered digitally, although only 4, or 9%, were produced in HD, and only 1 work was mastered in HD.

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Table 8
Production and Master Formats, Canada Independent Film and Video Fund Applicants[68]

Format	Capture	% of Apps. Reviewed	Master	% of Apps. Reviewed
Digital		**88.75%**		**66.25%**
DVCam	47		10	
Digital Betacam	12		36	
HD	3		1	
24 FPS Digital Video	1			
DV50	1			
DVC-Pro	1			
Mini-DV	4			
Digital Animation	2			
HHD			1	
DVD			5	
Analog		**8.75%**		**30%**
35mm			1	
16mm	2			
Betacam SP	5		23	
Mixed				
HD & Film	1			
DV & 16MM	1	**2.5%**		
Unknown			3	**3.75%**
Total	80	100%		100%

F.   Skills and Training Assessment

Canada's audio-visual workforce is highly skilled. According to the CFTPA, the film and television production industry generated an estimated 119,500 full-time equivalent (FTE) jobs in Canada in 2004/2005, comprised of 46,000 direct FTEs, and the balance, 73,500, in indirect jobs.[69]

1.   The Screen-Based Media Workforce of the Future

The traditional screen-based media industries are experiencing significant change with the rise of digital technology, globalization and media consolidation. At the same time, the media sector, by its nature, is in a constant state of transition, with new technologies, product and applications continually being introduced to the market.

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[68] From a sample of 80 applications to the CIFVF for the period closing in March, 2005, of a total of 164 submitted. While these categories of format may not all be mutually exclusive, they are shown as self-reported by applicants.
[69] See the CFTPA's *2006 Industry Profile*, page 13, Exhibit 7.

2. Film and Television Skills in Decline

According to educators surveyed, skills associated with analog technology and film have, not unexpectedly, seen reduced demand over the last 10 years. Examples of these analog skills include:[70]

⇒   Editing on a "Steenbeck[71]" or celluloid;

⇒   Linear/analog editing;

⇒   Post-production on film;

⇒   Analog sound mixing;

⇒   Negative cutting[72]; and

⇒   35mm and 16mm formats.

Other skills declining in demand include studio camera operators, theatrical distribution of physical media and master control operations.

3. Film and Television Skills in Demand

In addition to a greater focus on the industry acquiring non-technical skills, such as creative financing, marketing, corporate finance, business affairs and copyright expertise, the sector is expecting to see increased demand for the following skills:

Production

⇒   Digital production;

⇒   CGI[73] applications;

⇒   Three-dimensional graphics and special effects;

⇒   Digital animation;

⇒   Video/web editing;

⇒   Computer-aided design.

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[70] *Frame Work: Employment in Canadian Screen-Based Media – A National Profile*, Table 4.15, EKOS Research Associates, 2004

[71] A brand name that has become synonymous with a type of flatbed editing suite.; see http://en.wikipedia.org/wiki/Steenbeck

[72] The process of physically cutting and taping together pieces of film.

[73] Computer-generated imagery.

Working with new technologies[74]

⇒   Understanding high definition and digital technologies;

⇒   Projection

⇒   HD TV

⇒   Editing

⇒   Shooting

⇒   Production

⇒   Make-up[75]

⇒   Asset management[76]

⇒   Online distribution; and

⇒   Interactive storytelling, interactive content creation and production of convergent media.

It is also worthwhile to note that skills not directly connected with production were cited as highly in demand. 75% of survey respondents cited a "great lack" or "some lack" of business skills, including management, financial, legal and marketing.[77]

4.   Addressing Skill Shortages

By its heavy reliance on small enterprises and a freelance workforce, it is reasonable to consider that the industry would be able to enjoy a certain amount of flexibility in quickly identifying and establishing relationships with new vendors able to supply a broad range of digital services currently not available in-house or from established vendors. In fact, more than 88% of respondents in a recent survey stated they were either "very likely" or "somewhat likely" to solve skills shortages by hiring more freelancers/contract workers or out-sourcing work to contractors.[78]

Almost 70% of respondents suggested they are "very likely" or "somewhat likely" to provide additional workplace training for existing employees as a way to deal with skill

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[74] *Frame Work*, table 9.7.

[75] Traditional make-up techniques are considered inadequate for use in the high-definition environment.

[76] **Digital asset management** (DAM) refers to the practice and domain of organizing digital files for the purposes of maximizing potential for future use.

[77] *Frame Work*, table 9.9.

[78] Ibid, table 4.15.

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shortages. Approximately 50% said they were "very likely" or "somewhat likely" to work with training institutions to design needed training programs.[79]

5. Perceived Quality of Training

When confronted with different options for sources of skill training, film and television production companies, not surprisingly, favour employer-provided training as the highest quality option for meeting their training needs.[80]

Generally speaking, private training institutions were seen to provide somewhat higher quality training than public institutions. The only exception was for BC firms, which were significantly more likely to say that the training provided by private institutions was of low quality.

6. Skills Development

A majority (between 82-90%) of respondents participating in the Frame Work survey felt that skills in all technical areas are being developed at least somewhat adequately in education and training institutions.[81]

Opinion was less positive with respect to general business skills (management, financial, legal, marketing); with 25% responding that education and training institutions were not adequately developing these skills, which is notable in light of the fact that a large proportion of respondents thought workers greatly lacked these skills.

7. What Professionals are Saying

The industry professionals we interviewed for this project did not report finding a skills shortage in the area of digital production, but at the same time felt that more emphasis was needed on training. Several cited a belief that Canadian crews have had an opportunity to be exposed to US service based productions, and that a skill transfer took place during these shoots. Others stressed that the freelance nature of the workforce has made training a "survival" skill, and thus inculcated the workforce with a tendency to stay current by attending training sessions whenever possible. One producer felt that, while there were a wide variety of special interest training programs available, more were needed for the "average working urban producer." Several producers stated that they carefully picked their technical crews, returning to those craftsmen and craftswomen in whom they had confidence, and one producer reported seeking technical assistance from a camera manufacturer to ensure that a shoot would take place uneventfully. On the other hand, one interviewee said that it was a struggle to stay current, though he was doing so.

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[79] Ibid.
[80] Ibid, table 4.16.
[81] Ibid, table 9.9.

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8. Existing Training Offerings

Canada offers aspiring filmmakers a wide variety of courses and training programs. For the purpose of this assessment, we identified a large sample of formal training programs from across the country, including degree, certificate, and professional development programs, and examined the publicly available materials in an effort to determine if the instruction offered covered tradition film or digital techniques.[82]

This exercise was interesting from several perspectives. First, while there are various compilations available of training, education, and professional development courses, these compilations all vary in terms of length, completeness, and accuracy. Thus, the aspiring student or motivated professional is obligated to sift through literally dozens of sources in an effort to learn of educational and training opportunities. One of the most complete resource lists for training opportunities is contained in the Hot Docs Guide to Training Opportunities in Canada for Documentary Film; most of the opportunities listed in the guide apply to filmmakers generally, and not just documentary producers.[83] Another good source for information on training is an article that appeared as a "Special Report" in *Playback* in January, 2006, on schools and training in the sector. The article noted that schools and training programs across the country are wrestling with the challenges of providing updated curricula and facilities. For example, John Greyson, assistant professor, production, at York University, noted the difficulty in planning, remarking "it's a difficult proposition when you have to make long-term plans that potentially render equipment outmoded and irrelevant….but it's all about HD. There is no stopping the move away from celluloid." Half of Greyson's narrative film students shoot their short projects on 16mm, but he was quoted as "lament(ing) that it may be the only time they'll shoot on film in their entire filmmaking careers."[84]

Second, having identified educational providers, information on education and training is presented in a variety of ways. While this is to be expected, it makes comparisons across programs difficult, especially with respect to the technical aspects of a program. Many programs simply advertise that they offer student training on the "latest" available equipment, or instruction in "current" film and television-related software applications. This presents a second challenge for students and professionals: once they have identified the programs that meet their resources and needs, it is difficult to ascertain exactly what is being taught. While this may be less of an issue for more traditional industries, it is a possible impediment to workforce education and training in a rapidly changing field. At the same time, one theme that emerged from our interviews was that the pursuit of cutting edge technology can be a distraction in education; that students need to concentrate on basics, such as storytelling, scene composition, use of lighting and colour, and editing techniques, and the basics of both analog and digital technology, and that a solid foundation will provide students with the skills they need to adapt to continually changing technology.

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[82] This survey did not include provincial and municipal independent film and video cooperatives.

[83] See: http://www.hotdocs.ca/assets/doc_training_opportunities.pdf .

[84] *Playback*, January 23, 2006, page 25.

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In terms of specific programs, we independently looked at over 40 programs that were advertised in various guides as providing film, television, or video training or education for students and professionals. Of those, just over 30 (32) were true production courses (as opposed to "film studies", "cinema history", "visual arts", or related courses that did not primarily teach audio-visual production.) Of 32 audio-visual production programs examined for this study, 23, or 72%, advertise that they offer at least some training in digital production techniques. This is not to say that the others do not offer digital production courses, but simply that it cannot be readily ascertained if they do offer digital courses.

Most common digital technology-based courses were those in digital editing and postproduction work, which is not surprising since digital technology has existed in these areas longer than in others. Where courses were distinguished between television and film, television coursework tended to be described as video-based production, and often specifically described as digital, whereas film courses tended to require students to learn production techniques using an 8mm or 16mm format, often as a complement to digital techniques.

Our perspective in researching digital audio-visual skills programs is echoed in a report commissioned by the Canadian Cultural Human Resources Council (CHRC). The March 1, 2005 report, "Training Gaps Analysis of Documentary Filmmakers", stated "The diversity of organizations offering training to documentary filmmakers is both a strength and a weakness: a weakness in that there is a very complex, piecemeal training structure with limited (if any) coordination. As one survey respondent noted, there are 'too many disparate/competing groups.' However, this can also be a strength in that…'one policy or opportunity is not as good as a wide variety.'"[85]

The CHRC report goes on to state that "many filmmakers are not aware of what training is available…there is no centralized location where filmmakers can get information about training."[86] Of the filmmakers surveyed for the CHRC project, 52% expressed a need for training in production, and 62% expressed a need for training in post-production, areas where digital technology can play a meaningful role, and the report noted that "on-going tech refresher courses were desired, specifically on new camera technologies, new editing technologies, and the impact of editing technologies on broadcast options."[87] The Canadian Cultural Human Resources Council (CHRC) has commissioned a Film and Television Industries National Training Database, and this database should be helpful in addressing the fragmentation of information in the market with respect to training offerings that provide digital training.[88]

Audio-visual production courses surveyed for this study are set forth in Appendix D. Note that the information summarized for each was based upon a review of publicly available materials, and this list is not represented as a definitive, comprehensive list of audio-visual production training and education courses in Canada, but simply a large representative

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[85] See text of the report at http://www.culturalhrc.ca/research/DocFilmGapsAnalysis-e.pdf, page 12.

[86] Ibid, page 24.

[87] See text of the report at http://www.culturalhrc.ca/research/DocFilmGapsAnalysis-e.pdf, pages 6, 8.

[88] See http://www.culturalhrc.ca/CHRCProjects/pdf/Web_info_on_TDB.pdf for project notice.

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sample. Links jump to web pages offered by the institution which provided the most detail, varying from pages that show coursework, to department or institution pages. Finally, in some cases the institution shown in the Appendix are able to offer training as a result of funding received from other bodies or organizations.

IV Policy Implications and Further Inquiry

A. Policy Implications

The digitisation of the film audio-visual sector presents opportunities and threats for those who make policy and audio-visual content. One view is that the unleashing of digital technology will allow the media landscape to become more richly populated with a diverse range of stories and voices – and this potential does exist. This view was reflected by the Chairperson of the NFB just under two years ago: *"Digital film, E-cinema – theatres equipped with digital projectors...could provide a golden opportunity to reinvent a theatre network that will help us reach the core of our market, Canada and its 30-odd million people...E-Cinema will make it possible to change the monolithic distribution structure as we know it, particularly in other parts of Canada."*[89]

With effective use of digital technology, lower budget productions are being made increasingly viable, which will likely lead to a greater pool of available content. The costs of technology tend to decrease over time, and as the price of HD equipment falls, filmmakers with smaller budgets will be able to avail themselves of the same technology, and produce the same quality images, as larger budget productions. In fact, as we have seen in this report, lower-budget filmmakers have been one of the groups which have been earlier adopters of digital technology, albeit in SD.

Congruently, digital content affords distributors - and filmmakers themselves - new channels to make their content available to consumers, including Internet distribution and Video-On-Demand (VOD).[90] It is not difficult to conceive a shift in the distribution paradigm, migrating from a "product push" distribution model to a "consumer pull" model.

Yet while technology does create new opportunities, it must also be recognized that the digital transformation also presents threats for the Canadian audio-visual sector – <u>and that the marketplace forces at work in the analog world, which reward commercial success, economies of scale, and concentration, are also at play in the digital world.</u>

The threats and opportunities arising from this digital evolution include:

❑ **Workforce Preparedness –** Canada has created a relative "powerhouse of diverse talents,"[91] with annual production of $4.50 billion in 2004/2005, nearly 119,500 full-time equivalent jobs in the sector, and $1.46 billion in foreign location production attracted in 2004-2005.[92] The competitive forces working to take service production away from Canada

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[89] Jacques Bensimon, Government Film Commissioner and Chairperson of the NFB, on The Future of Quebec Cinema (2004-11-17)

[90] "Digital Post Democracy" by Steve Hamilton, *MovieMaker*, Issue 48, Fall, 2002

[91] Remarks to Standing Committee on Canadian Heritage by Marcelle Lean, Ontario Media Corporation, April 6, 2005.

[92] *Profile 2006:An Economic Report on the Canadian Film and Television Production Industry*, Canadian Film and Television Production Association, pps. 9-10.

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are only increasing as more jurisdictions explore mechanisms to encourage international producers. Digital media, coupled with the global economy, presents increasing possibilities for work to move from Canada – not just production work, but post production, as well, with producers being able to send content to India or the Czech Republic for colour correction, effects, or mastering work. Workforce adaptation to new technologies would set the foundation for continuing growth in the sector, both for domestic and service production; failure to adapt would jeopardize the economic health and competitiveness of the sector, especially with regard to service production, which is highly mobile and can choose from an increasingly competitive array of choices for locations.

❑ **The Rise of Storytelling** – Canadian productions are challenged to compete in terms of budget size with the big budget offerings of large, multinational entertainment companies. Digital technology could potentially be a critical factor in competing against bigger budget productions by putting more affordable production and post-production equipment in the hands of the existing resource base in Canada. Digital technology would not only make filmmaking more accessible to filmmakers with smaller budgets, but would allow creative storytelling to be the distinguishing factor over high budget aesthetics, as has been the advantage in the past.

❑ **Access to Distribution** – There has long been debate over the extent to which Canadian productions can access distribution in Canada:

⇒ On the positive side, digital distribution will eliminate the costs associated with physical prints. If Canadian filmmakers face lower distribution costs, they should be able to get to market more easily.

⇒ At the same time, however, satellite distribution is emerging as the preferred delivery vehicle to convey digital movie files to cinemas. The cost of a satellite delivery infrastructure will not be insignificant, which in turn means that it cannot be presumed that digital delivery will reduce distribution costs quickly and sharply.

⇒ Furthermore, with commercial distribution in Canada being treated as part of the "North American" market – meaning as a small subsegment of the US market – Canadian filmmakers could face the same challenges in a digital world as they face today in accessing cinemas. As mentioned previously in this report, the UK Government has established a program to support conversion to digital cinema in exchange for access to screens by non-mainstream film. Another approach is being taken in Singapore, where the Infocomm Development Authority's (IDA) Digital Cinema Exchange (DCX) initiative will pitch the country as the service node through which content "from Hollywood to Bollywood" is processed, managed and distributed first to South Asia, then the world. The DCX initiative calls for new skills in the fields of digital film processing, encryption, treasury functions, and digital assets and rights management, as well as extensive fibre and satellite connectivity, and trusted legal and financial frameworks to deliver digital content securely to customers.[93]

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[93] http://it.asia1.com.sg/specials/issues20030924_002.html

⇒   It has long been understood in Hollywood that to control distribution is to control the market: digital distribution to cinemas holds the promise that the market will become more accessible, and the threat that existing structures will be replicated.

❑   **Marketing** – Digital technology may make it easier for Canadian filmmakers to reach potential audiences, for example, by lowering the costs of producing and distributing promotional trailers. At the same time, large multinational media companies will find that their already massive promotional budgets will go even farther.

❑   **Programming of cinemas will become easier for cinema managers** – No longer having to contend with bulky reels of film mounted on fixed platters, it will become possible for cinema managers to more easily make unexpected changes in programming. On the positive side, this means that a manager might be more inclined to screen a less commercially attractive film, since the burdens of causing the film to be shown will amount to no more than reprogramming a projection. On the other hand, this flexibility may cut both ways: with tickets being sold online and by telephone, a cinema manager may be able to anticipate that the Hollywood blockbuster in her multiplex is about to sell out, allowing her to easily reprogram another showing of that same blockbuster – displacing a Canadian film that might have fewer advance sales, or a lower marketing budget..

❑   **Reaching remote and underserved audiences across Canada's expansive geography may become less of a challenge with digital technology** – Without the cost of duplicating, shipping, tracking, inspecting, warehousing, and destroying prints, it may be more cost-effective to establish and serve screening venues in isolated, sparsely populated locations, bringing entertainment, culture, and public service programming to new audiences. On the other hand, this may lead multinational companies to see these locations as part of a new market for big budget entertainment offerings.

❑   **Cost pressures are emerging, especially on the television front** – This issue emerged clearly over the course of interviews related, and was often framed as one of "cost recovery." Unsolicited, a number of interviewees expressed views that broadcasters, the CTF, or some other entity should "make up" the cost differential, at least for some period of transition, until HD becomes the production norm. As one producer put it, "who is going to pay me for the additional costs of shooting in HD?" At the same time, broadcasters express a view that they will not pay a premium for HD – that it will become the new standard. As one broadcaster put it, "my laptop at work has to be replaced every three or four years – I simply have to accept that, and adapt." In the middle are the equipment companies, who will have to learn to amortize the costs of equipment more quickly as the equipment life cycle more closely comes to resemble the lifecycle for computer equipment. In a system that is chronically short of financing, and dependent upon a complex and delicate balance of government, commercial, domestic, and international sources of funding, integration of new costs is a challenge.

B. Readiness

Is Canada's production industry ready for the transition to digital production? In the area of post production, Canada exhibits a good range of facilities and technicians who are already part of the transition to digital technology. A combination of factors, including the relatively long period of time during which digital technology has been used in post production, as well as the strong base of service production companies, which have encouraged the use of digital technology, has created a sector which offers a broad array of skills, facilities, and equipment to filmmakers.

In the area of feature film production, Canada is not behind, as the move to digital production has come more slowly than in other areas. The percentage of Canadian feature films shot on film is roughly comparable to the percentage of foreign service features shot on film. However, feature film production does seem poised to advance more rapidly now with the establishment of digital cinema projection standards, and with the development of the latest generation of digital HD cameras. New technology will require new skills, new budget templates, and a willingness to embrace the risks incurred by embracing such technology.

It is the area of television, there are the most immediate challenges, where the question is not "how to transition to digital", but rather "how to transition to HD." On the positive side, digital and HDTV distribution is making steady progress:

❑ The Canadian public has access to digital programming from a variety of sources, including CBC/SRC, Télé-Québec, TQS, TVA, City-TV, Global, Discover Channel, Movie Central, Omni, SportsNet, TSN and TMN; most already air digital programming in the form of SDTV and HDTV and some are slated to begin in the near future.[94] Several majors already offer an impressive line-up of HD programming, including prime time event programming.[95] For example, the CBC officially began broadcasting in HDTV in March 2005,[96] and continues to produce selected programs in HD, such as "*Faerie Queen*" and "*Last Dance: The Rex Harrington Story*." This transition is viewed as urgent in order to maintain consumer interest over time, thus Canada is aiming to position itself as a leader in this area.

❑ Canadian electronics retailers are offering a full range of HD receivers using the latest technologies (LDC, DLP and LCOS) while offering declining prices.[97] As such, Canada is currently recognized as one of the regions with the highest digital receiver penetration.

At the same time, Canadian producers are unsure how they will pay for the transition to HD. In a sector that already faces severe financial pressures, the 5-15% additional cost of producing in HD vs. SD represents a tangible hurdle to producing in HD. And although not conclusive, CAVCO data suggests that CPTC television programming is much more likely to be shot in SD than is foreign television programs produced in Canada: 79% of CAVCO CPTC certified television productions were shot on tape, vs. 14% of CAVCO PSTC certified television programs. There

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[94] See www.cdtv.ca

[95] See www.cdtv.ca

[96] See www.digitalhomecanada.com/hdtv

[97] See www.cdtv.ca

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may be reasons for this disparity apart from the technology: for example, PSTC productions shooting in Canada may, as a group, have higher budgets, and thus be more likely to use traditional and comparatively expensive 35mm capture. However, this is potentially alarming, and should be the subject of further inquiry, as recommended below.

C. Areas for Further Inquiry

The continuing evolution of audio-visual production and distribution technology is now a permanent feature of the sector, requiring policymakers to oversee a continually changing sector. In order to facilitate oversight, suggestions for further inquiry include:

❑ **Improving data collection.** As noted above, a variety of organizations collect data on digital formats used in audio-visual production in Canada. We would recommend that a single, standardized approach be used by all organizations, one which "forces" applicants into narrow predefined response fields so that data can be easily and usefully compared. This would require an undertaking to meet with stakeholders, manage the transition, define response fields, and establish a mechanism under which collecting organizations pass data to PCH.

❑ **Training.** Workforce training will become a critical component of tomorrow's audio-visual sector. The availability of better and more uniform information for students and professionals about training offerings, routine in-depth surveys of training needs and skill availabilities, certification of skill levels with new technologies, and the creation of specific audio-visual technical skills fora for high level discussion of these issues with stakeholders are areas that should be further explored.

❑ **The Television Sector.** We believe that there is no shortage of interest among television producers in moving to HD, but instead a real concern over costs that hinders their ability to move to HD production. Producers are being asked by broadcasters to deliver HD content, yet broadcasters are unwilling to pay more for content in HD – we heard this complaint from both English and French producers. This subject is complex and important enough to be the subject of a special inquiry, one that involves not only producers, but broadcasters, equipment suppliers, post production, guilds, and other stakeholders, with the explicit purpose of developing and assessing tangible policy instruments that might be used to encourage the transition to HD.

❑ **Encourage the Broad Transition.** The Government of Canada is committed to fostering a more cohesive and creative Canada, and to ensuring that a strong Canadian identity is reflected in and accessible to Canadians in a wide variety of cultural products. To that end, the Government has established itself as a stakeholder, advocate, champion and financial supporter of the audio-visual sector. As a result, industry stakeholders will be looking to the Government for a broad range of support to facilitate the digital transition. While there will continue to be distinct audiences and markets for media, in many ways digital technology allows a producer to think more holistically about his work than ever before. This creates the opportunity to develop industry support policies that take into account the interests of all stakeholders, and the overall objectives of policymakers, to create integrated policies that contribute in different ways towards the same goal.

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Appendix A – Terms of Reference

Project Title

STATUS OF DIGITAL PRODUCTION IN CANADA

Background and Objectives

Digital production in Canada is on the rise. The Department of Canadian Heritage would like to know what types of Canadian content are being produced in digital formats, what are the different formats being used, what amount of Canadian Content is being produced digitally as compared to traditional media, and what types of equipment are being used for these types of production.

The study will assist the Department in making policy decisions related to the production of Canadian content.

Description and Scope of the Work

The contractor will provide a draft and final report outlining the research findings. In drafting the report, the contractor will consider the non-exhaustive list of questions below:

1) What volume of production (i.e. $/hour / quantity / percentages) is being shot in digital formats and specifically in HD[98]?
2) What types of production are being shot in digital formats? What's the breakdown of formats used: how much programming in standard definition format versus the various forms of high definition format? Interactive formats?
3) What are the reasons for using digital formats (budgets, aesthetics, etc…)
4) What are the specific technical requirements for digital production?
5) Why shoot digitally? (budget, aesthetics, etc)
6) What is the digital production volume (particularly in HD)
7) Are there any correlations to budget size and success in reaching audiences;
8) How are digital productions being converted for distribution across different platforms (e.g. theatres, DVD, TV, Internet, and mobile devices);
9) How much certified Canadian content is being shot digitally versus foreign location production;
10) Does Canada's film and television industry possess the technical skills for digital production, especially HD;
11) To what extent is digital production broken down between English and French-language production communities; do they face the same challenges;
12) What are the costs associated with digital production formats versus traditional non-digital production.

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[98] Differences between English-language and French-language to be looked at (as well as Aboriginal languages if available)

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Types of productions to be analyzed:

- o Feature films
- o TV drama
- o Documentaries
- o Short films
- o Film and Video Coops
- o Training institutions (broader than national training schools)

Distribution platforms to be analyzed
- o Destined for television broadcast
- o Theatrical release
- o DVD release
- o Festivals
- o Internet
- o Mobile devices

Although not an exhaustive list, the following are recommended sources of information the contractor would be expected to consult:

- o Canadian Independent Film and Video Fund
- o Canada Council for the Arts
- o National Film Board of Canada
- o Canadian Television Fund
- o Telefilm Canada
- o Canadian Audio-Visual Certification Office
- o Canadian Film and Television Production Association
- o Association des producteurs de films et de télévision du Québec
- o Canadian Society of Cinematographers
- o Independent Media Arts Alliance
- o Equipment rental companies
- o Producers, Directors and Directors of Photography

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Deliverables

Although the reports will be required in one official language only, it is expected that, due to the nature of the issues being investigated, the contractor will consult with both French-language and English-language organizations and individuals in order to provide a complete picture of the use of digital and HD technology in Canada.

The Draft report is due by February 28, 2006

The Final report is due by March 15, 2006

A PowerPoint presentation of the final results may be required following the submission of the final report.

Responsibilities (Contractor vs. Crown)

The Film and Video Policy Directorate can provide contact information for the organizations to be contacted as well as some background material on the issue.

Meetings

An initial meeting will be scheduled at the mutual convenience of both the contractor and the Directorate in order to answer any outstanding questions. A second meeting will be scheduled once the majority of the research has been completed in order to ensure that all of the relevant questions have been adequately addressed and to provide final guidance for the drafting of the report. Throughout the process, either the contractor or the Directorate may initiate additional communication. Meetings may take place in person or by phone.

Intellectual Property

Intellectual property vests with the contractor with license to use.

Length of the Contract

Start date of contract: January 23, 2006

End date of contract: March 15, 2006

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Appendix B – Interview Guide, Status of Digital Production

A. Background

Kelly Sears Consulting Group has been engaged by the Film and Video Policy Directorate, Department of Canadian Heritage to profile the state of digital audio-visual production in Canada. The objectives are to compile information on digital production to assist the Department in making policy in support of Canadian audio-visual producers.

As part of our study, we are conducting interviews with industry professionals who have expertise in the area of audio-visual production, and digital production, in particular. The interview will not last more than 30 minutes. We thank you for your time and input.

B. Questions

Please review the following questions in advance of your interview. If you have no opinion on a particular question, feel free to skip it.

1. **Your role within the Canadian audio-visual production industry.** Please provide a brief overview of your role within Canada's production industry, including a very brief description of your company or organization, your personal role within the organization, and your professional background.

2. **Description of your experience with audio-visual production.** Please describe the type of production work with which you have experience or familiarity, including the format (feature film vs. television or short subjects), and the distribution medium for those works.

3. **Volume of Digital Production**. In your experience, what volume of the productions that you are familiar with are filmed digitally? Post-produced digitally? Delivered digitally for viewing? How are these volumes different across media and platforms, i.e. feature film vs. television?

4. **Digital Production Process**. Please describe the role that digital technology plays in the production, post-production, and delivery of productions that you are familiar with, distinguishing between media.

5. **Decision-making process**. Please describe the factors that are taken into consideration in deciding to utilize digital production techniques.

6. **Description of Digital Production Technology.** Please describe the types of technology used for digital production, including equipment suppliers and post production facilities.

7. **Relative Costs of Digital Technology**. Please describe the relative cost differentials between digital and analog production methods.

8. **Training and Availability of Skilled Artists and Technicians.** In your opinion, are there adequate and available skilled digital artists and technicians to support digital Canadian productions? How did you reach this conclusion?

Appendix C – List of Interviewees

Tom Berry – President, Reel One Entertainment

Jacques Blain – Founder and Executive Producer, Cirrus Productions

Benoit Dubois – Director General, Regroupement pour la Formation audiovisual du Québec

Glyn Evans – Founding Partner, Stonehenge Media Group Inc.

Scott Galley, – Manager, Business and Legal Affairs, Canada Audio-Visual Certification Office

Grace Gilroy – Producer (Alien vs. Predator, Hope Springs, Scary Movie 3, Josie and the Pussycats, Snow Day)

Robin Jackson – Executive Director, Canada Independent Film and Video Fund

Jennifer Jonas – Director/Producer, (Red Violin, Cake, Childstar)

Suzanne Keppler – Manager of Program Data, Canadian Television Fund

Sylvain Lemaite – Sales Representative, Vision Globale, Inc.

Fred Mattocks – Head of English Production, CBC

Michael McEwen – President, Canada Digital TV

Sayed Rawji – Director, Technical Innovation and Resources, National Film Board

Claire Samson – President, APFTQ

Mark Seguin – Vice President, Feature Film and New Media, Canadian Film and Television Production Association

Richard Stringer, CSC – Director of Photography

Virginia Thompson – President, Verite Films (Corner Gas)

Appendix D – Training Programs Surveyed

British Columbia

<u>Capilano College</u>. At least one specialized course in digital techniques is offered.
http://www.capcollege.bc.ca/programs/film/prodcourses.html

<u>Emily Carr Institute of Art & Design</u>. At least one specialized course in digital techniques is offered, "DIVA 200 Digital Media".
http://www.eciad.ca/www/programs/courses_bm_integrated_media.html

<u>Gulf Islands Film and Television School</u>. Offers coursework in both digital video and super 8mm and 16mm
http://www.giftsfilms.com/courses/program.asp?id=2

<u>Langara College Film and Television School</u>. At least one specialized digital production course is available, FLMA 1150: "Editing Techniques, Styles and Digital Camera."
http://www.langara.bc.ca/filmarts/index.html

<u>Simon Fraser University, School for the Contemporary Arts</u>. Course descriptions do not distinguish between digital and analog coursework.
http://www.sfu.ca/sca/html/film_1.html

<u>University of British Columbia.</u> Splits discipline into video vs. film production, the latter in 16mm, the former in simply "video", with editing being done "in current techniques."
http://www.film.ubc.ca/programs/production/film_production_diploma.htm

<u>Vancouver Film School</u>. Teaching both analog and digital, with specific courses for analog (Arriflex Super 16) and a Digital Camera Workshop.
http://www.vfs.com/curriculum.php?id=3

<u>Victoria Motion Picture School.</u> Seems to mix both digital and analog; definitely digital effects work is taught ("non linear" editing.)
http://www.vicfilm.com/film.htm

Alberta
<u>Alberta College of Art and Design.</u> Department is named "Media Arts and Digital Technologies", and offers full flexibility in terms of course design by students so that they may combine digital and analog coursework.
http://www.acad.ab.ca/madt.html

Grant MacEwan College. The area of study is a Major in "Design and Motion Image", and the coursework is heavily digital; a fundamental required course is "Digital Applications". It is not clear if and to what extent analog production techniques are being taught.
http://www.macewan.ca/web/pvca/visual/Program/DetailsPage.cfm?id=1019

Southern Alberta Institute of Technology. Provides coursework in both traditional and digital production.
http://www.sait.ca/calendars/daycalendar/calendarmain.htm

Manitoba

National Screen Institute. Sponsors teams across Canada under a program which includes professional development, and packaging of a feature film project, but technology is not specified.
http://www.nsi-canada.ca/featuresfirst/index.shtml

Saskatachewan

University of Regina. Specifies that digital imaging is part of the curriculum.
http://www.uregina.ca/finearts/media/programs_detail.html#bfa_fnv_prod

Quebec

Concordia University. Mel Hoppenheim School of Cinema offers courses so that "students experience digital and analogue (sic) technologies…"
http://finearts.concordia.ca/html/cinema.htm

International Institute for Image and Sound (INIS). Does not specify technology.
http://www.inis.qc.ca/

Parlimage. Does not specify technology.
http://pages.infinit.net/parlimag/main/framemain.html

Institut Trebas. Specifies both 16mm and digital techniques being taught.
http://www.trebas.com/fr/montreal-fvp.php

Atlantic Provinces

Nova Scotia College of Art and Design. Offers extensive digital coursework, and requires students to take a 16mm production course.
http://www.nscad.ns.ca/study/media/media_arts_program.php

Ontario

Academy of Canadian Cinema and Television.   National Apprenticeship training program, offered through offices and at locations across the country. Technology not specified.
http://www.academy.ca/dev/natp.htm#What%20is%20the%20National%20Apprentic eship%20Training%20Program?

Canadian Film Centre. Programs for both TV and Film, but course descriptions do not specify whether analog or digital.
For film, see: http://www.cdnfilmcentre.com/training/film.html
For TV, see: http://www.cdnfilmcentre.com/training/resident.html

Canadian Film and Television Production Association. The CFTPA promotes a variety of mentorship and training programs, but does not specify the extent to which these programs involve digital technology, most of which are held under the auspices of different sponsoring organizations.
http://www.cftpa.ca/mentorship/programs_eng.htm

Canadian Screen Training Centre. Not specified if instruction is in digital or analog techniques.
http://www.cstc.ca/default.asp

Cofederation College. Not specified if instruction is in digital or analog techniques.
http://www.confederationc.on.ca/programs/mediaarts.asp

Director's Guild of Canada. Professional Development is offered to members through the District Branches of the Guild, which at any point in time have a variety of courses on offer, some of which specifically address digital technology; for example, in mid-January, 2006, the Ontario District was advertising a course to be offered "in the future" to members, titled "Introduction to Digital Photography & Stitching."
http://www.dgcodc.ca/gostandard.html

Humber College of Applied Arts and Technology. Specifies digital, does not specify film.
http://postsecondary.humber.ca/04831.htm

International Academy of Design. Has non-specified "film production" courses, as well as digital video courses.
http://www.iadt.ca/programs/index.asp

Niagara College School of Media and Design. Course offering includes digital editing, and filming in 16mm.
http://niagarac.on.ca/studying/programs/fulltime/media_0122/

Queen's University. Productions are shot on either 16mm or digital media. Editing work is digital.
http://www.film.queensu.ca/NLEditDV.html

Ryerson Polytechnic University. Not specified, but largely appears to be digital.
http://www.ryerson.ca/ualca/programs/imagearts.html
http://www.ryerson.ca/ualca/programs/rt.html

Sheridan Institute of Technology.   Offers courses in both digital and analog production.
http://www.sheridanc.on.ca/protraining/filmtv/index.html

University of Waterloo Digital Arts Communication. Not a film production program *per se*, but offers coursework in digital techniques.
http://arts.uwaterloo.ca/arts/ugrad/dac.html

University of Western Ontario Not specified whether digital or analog coursework is available.
http://www.fims.uwo.ca/

York University. Offers courses in both digital and analog production techniques.
http://www.yorku.ca/web/futurestudents/programs/template.asp?id=401