

BUSINESS PROCESS MODEL FOR INCORPORATING DESCRIPTIVE AUDIO IN TV SHOW PRODUCTION

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Keywords: Business Process Modelling, Audio Description, Process Analysis.

Abstract: Audio Description (AD) is an effective tool which can enhance the comprehension of a TV show or a movie for visually impaired audiences. Unfortunately, the implementation of AD tends to be expensive and only a few companies adopt this practice. For example, only a handful of films are audio described for the visually impaired. This paper evaluates an Alternative Method, a new process model developed for a TV show production industry, in which AD is incorporated into the production process. The currently adopted practice or a Conventional Method requires sending an episode to a third party describer in order to add AD. According to the preliminary results of the analysis conducted in this paper, Alternative Method is slightly more efficient than a currently adopted practice but allows reducing the production time and yields a superior quality product. The contribution of this research is that it provides a way to improve efficiency and effectiveness of AD, which will increase the range of its implementation.

1 INTRODUCTION

According to Statistics Canada, WHO and CNIB, there are 124 million people in the world who are visually impaired. The Universal Design Theory aims to reduce the physical barriers between people with disabilities and those without by incorporating the needs of all during the design phase rather than an afterthought (Connell et al., 2010). Audio Description (AD) is one such practice, which uses audio commentary to enhance the engagement of persons with visual disabilities (Piety, 2004). AD is used as a secondary track in TV programs, movies or theatre (Miers, 1995), which improves the comprehension level of a program (Peli, Fine, & Labianca, 1997; Pettitt, Sharpe, & Cooper, 1996; Schmeidler & Kirchner, 2001). The standard practice for adding AD (Conventional Method) is for studios to send the post production copy of a show to a third party service provider, who would create a separate script to incorporate descriptive elements (Fels, Udo, Ting, Diamond, & Diamond, 2005).

In Canada, the Canadian Radio-television and Telecommunications Commission (CRTC) mandates broadcasters to audio describe a minimum of four hours of primetime programming a week (CRTC, 2009). Broadcasters ensure that they meet, but do not surpass, CRTC regulations, for they have yet to find a business model which makes AD financially worthwhile. In the US, the Americans with Disabilities Act (ADA) requires theatres to provide “effective communication” for all, but does not explicitly state approved criteria through which this is to be achieved. The ultimate decision to describe movies falls on the shoulders of the production studios, which often claim that the cost is prohibitory in implementing AD universally.

This paper explores the possibility of reengineering a TV show production process in order to reduce the costs involved in adding AD. It expands on the proposition introduced by Fels et al that AD should be developed by a TV show creative team and not a third party vendor (Fels, Udo, Ting, Diamond, & Diamond, 2005). We argue that AD should be incorporated during all stages of the show production and propose an Alternative Method,

which will generate a superior product and improve production to market timing.

The objectives of this paper are: (1) to create a new business process model for integrating AD, and (2) to determine whether creation of accessible content during each of the production phases is efficient and effective. The new model will be evaluated in a comparative study using time and production cycle as the performance metrics. The contribution of this research is that it provides a way to improve efficiency and effectiveness of AD, which will increase the range of its implementation.

2 LITERATURE REVIEW

2.1 Background on AD

AD is a relatively young science developed by Gregory Frazier in 1970s who encouraged blind consumers to adopt it (Snyder, 2007). Unfortunately, research on the effectiveness of audio description between 1970s and the nineties is very limited. Katz et al. conducted a study in 1993 in order to determine whether incorporating descriptive audio increased the comprehension of the audiences. The study clearly showed an increased level of comprehension when visually impaired audiences viewed programming with audio description (Schmeidler & Kirchner, 2001). Other studies also confirm that AD enhances comprehension of the television programs, leads to increased cultural participation and its benefits are not limited to just those with visual impairments (Peli, Fine, & Labianca, 1997; Pettitt, Sharpe, & Cooper, 1996; Schmeidler & Kirchner, 2001).

The standard practice for audio describing a film (Conventional Method) is to send the completed production to a third party vendor, who embarks on a separate production process in order to add AD (Fels, Udo, Ting, Diamond, & Diamonds, 2006). This reactive approach of adapting products and services to those with disabilities is counter intuitive to the intentions of the universal design theory. Emiliani & Stephanidis argue that the reactive approach to accessibility in most cases results in some loss of functionality and is programming intensive and as such financially unattractive (Emiliani & Stephanidis, 2000).

In the Conventional Method the original creators are rarely involved and decisions on inclusion and exclusion of segments for AD are left to the third party vendor who interprets the stylistic nuances, action sequences and emotional characteristics.

Since the original creation team loses control over the process, the final product is often altered and AD is segmented due to the limitation of time and space (Fels, Udo, Diamond, & Diamond, 2006). Conventional Method for AD is also a third person narrative style, in which audio describer is responsible for commenting but not altering the original production. Fels et al. compared a third person AD style with a first person narrative style. A test group of blind members reported that the first person version was less trustworthy but preferred it anyway because it was more entertaining (Fels, Udo, Ting, Diamond, & Diamond, 2005).

Fels modified the Conventional Method by using a first person narration technique, changing the narration to be subjective and using the original creative team to create the audio descriptive track during the post-production stages (Udo & Fels, 2009). This paper extends the method further by suggesting that rather than during the post-production phases, the creative team should incorporate AD process in all phases of the production. This requires that the current production process be modelled and re-engineered to incorporate AD. The next section discusses various Business Process Modeling techniques from which a suitable tool to model a new business process is selected.

2.2 Process Modelling Techniques

Before an AD process can be reengineered, the various workflow processes involved in film production must be documented. Business Process Modelling (BPM) is used to document workflow processes, which are mapped down to activity level (Van der Aalst, Ter Hofstede, & Weske, 2003; Havey, 2005; Hill, Sinur, Flint, & Melenovsky, 2006; Van der Aalst, Aldred, Dumas, & Ter Hofstede, 2004). The technique targets workflow optimization and business processes integration (Hung, 2006). While BPM has reached a certain level of maturity in recent years and has great potential to deliver benefits in a wide range of application areas, it is typically applied by medium to large sized companies (Ouyang, Ter Hofstede, La Rosa, Rosemann, Shortland, & Court, 2008).

The following five categories of BPM techniques are commonly used in business processes modelling: Flow Chart, Role Activity Diagrams (RAD), Event-driven Process Chains (EPC), Unified Modelling Language Activity Diagrams (UML), and Business Process Modelling Notation – BPMN (Ko, Lee, & Lee, 2009). In order to select the most

suitable technique, it is best to first choose the objective for the process model, which can fall into one or more of the following categories: (i) increasing the level of process maturity, (ii) providing a blueprint for process analysis and reengineering, and/or (iii) creating a basis for developing computer systems (Bider, 2005).

Flowchart is a modelling technique, in which processes or algorithms are depicted as a sequential flow of actions, data and documents. The biggest strength of the technique is its simplicity. Flowcharts can be created fairly quickly, but they can easily become very big and difficult to analyse. Flowcharting techniques work best when in-depth analysis is required and which is often used when the level of process maturity must be increased.

RAD is a graphical representations of the processes based on the perspective of individual roles and their interactions. The technique is similar to flowcharting. It allows concentrating on internal processes and is used primarily as a 'supportive' technique. RAD can also represent inter-organizational interactions, such as those with suppliers and customers. The diagrams offer different perspectives of the processes and are intuitive to read. The biggest strength of the technique is its high level perspective, which makes it well suited for analysis and reengineering of business process (Aguilar-Saven, 2004).

EPCs were developed by the Institute for Information Systems at the University of Saarland, Germany (Ko, Lee, & Lee, 2009). In the 1990s, these modelling notations were very popular and were widely used. The technique is based on simple notations, focuses on specific functions and events which are evaluated in parallel in order to determine the optimal solution. Since the semantics of EPC is not well defined (Ko, Lee, & Lee, 2009) it is not recommended as a standard graphical technique for modelling (Van der Aalst, 2004; Kindler, 2004).

UML Activity Diagrams were standardized as a business process modelling technique in 2004 (Ko, Lee, & Lee, 2009). They are extensions of flowcharts and are the backbone of the object-oriented software engineering (Ambler, 2004; Wohed, Van der Aalst, Dumas, ter Hofstede, & Russell, 2006). Despite being a powerful business process analysis tool, the biggest deficiency in using the UML is that it does not allow capturing the interactions that occur in the process and organization (Russell, Van der Aalst, ter Hofstede, & Wohed, 2006). The technique is most often used for developing computer systems.

BPMN was released in 2004 and has rapidly gained wide acceptance since it bridges the gap between business analyst and IT personnel. The technique is compliant with flowcharting but allows for better flow control as it dissects processes at much greater level of granularity (Wohed, van der Aalst, Dumas, ter Hofstede, & Russell, 2006). BPMN can be mapped to an executable code and is extremely suitable technique for Information System development and integration.

The purpose of a process model developed in this paper is to create a basis for process analysis and reengineering. Various interactions with the external parties, which are considered to be integrated into the core process, have to be examined. Although a detailed dissection of the process is not required during this high level study, the suitable modelling technique should allow to further detail every process. RAD is a technique, which brings a high level perspective to the modelling process and allows depicting the impact of external and internal interactions on the 'core' organizational operations. The technique will be the most appropriate for this study since it also has a very extensive catalogue of notations that allows to further detail the process.

3 INTEGRATING AD WITH A TV SHOW PRODUCTION PROCESS

3.1 Research Methodology

The first objective of this study is to investigate and document an Alternative Method for integrating AD. The initial step will be to document a production process without an AD (NOAD). Then, a Conventional Method for adding AD during the distribution phase will be investigated. Finally, incorporation of AD during various stages of production process will be considered and a model of an Alternative Method will be developed.

The second objective of this paper is to determine whether creation of accessible content during each of the production phases is efficient and effective. To that end, an Alternative Method must be evaluated and compared to the Conventional Method and to the NOAD process. The evaluation will be supported by the qualitative analysis presented by (Fels, Udo, Ting, Diamond, & Diamond, 2005) and the results of a quantitative analysis discussed in this paper.

Quantitative performance measures, such as: time to market or costs, can be described with a numerical representation. Due to lack of sufficient data about the rates applied by the industry, this study does not evaluate the direct efficiency measures, such as cost or ROI. In this paper, the evaluation of efficiency is based on times required to complete the key processes, which can also be used as a proxy for costs. Show production time, which is measured as a time elapsed from a development stage up to a final distribution, is an important metrics in a TV industry. It will be used in this study as a second measure representing the effectiveness of each method.

The study uses a case of a 30-minute episode of a TV show called “Odd Job Jack”, in which Smiley Guy, the production house for the show, incorporated the description process during the production phase of the show (Fels, Udo, Ting, Diamond, & Diamond, 2005). The extra time required to add AD in each method as compared to the show with no AD is determined using: empirical data collected during the interviews with the third party describer, Valery Hussey, responsible for providing the audio description to the episode, information collected by J.P. Udo and data published in (Fels, Udo, Ting, Diamond, & Diamond, 2005). The results presented in the next two sections were collected for an episode, which has a 30-minute run time, but can be prorated for longer shows.

3.2 Process Models

The main five stages in the TV show production are: development, pre-production, production, post-production and distribution. Development is the creative stage of the production process, during which a script for the film is developed. A Director is hired, actors and narrators are recruited, and a writer finalizes the script during pre-production. The director transforms the script into a finished raw product and a show is created during the production stage. Once the raw footage for the show has been shot, it enters the post-production phase, during which the show is edited. The post-production show is then screened to potential distributors and is converted to a suitable format.

In this study all those phases were investigated in details. Although all key processes were modeled, only the high level view of the models is depicted in Figure 1 due to the space limitation.

The decision about adding AD to the TV show can be made during a development phase (first decision point in Figure 1) or at a distribution phase

(second decision point in Figure 1). First point marks the decision about incorporating AD into the entire production process (in-house), second marks the decision about adding AD after the show is completed.

Alternative Method is depicted in Figure 1 as a series of processes, which form a top branch from the first decision point. The bottom branch ends at the second decision point and includes key steps in the NOAD process. AD can be still added during the distribution phase using a Conventional Method, which is depicted in Figure 1 as a bottom branch from the second decision point.

3.2.1 Conventional Method

The first Process in the Conventional method is depicted in Figure 1 as “Review and Time – Cue Analysis”. The entire film has to be reviewed at least twice (Bard, 2010). During the first viewing, the overall theme and the creative vision of the film is identified. Next, the describer locates time cue’s where description is required. The writer needs to carefully observe the visual events, reduce the content to the most important information that can be conveyed in often only a few seconds available, and objectively translate it (Fels, Udo, Ting, Diamond, & Diamond, 2005). Review time would usually take twice as long as the runtime of the video itself (60 minutes) and “Time – Cue Analysis” can take anywhere between 4-6 times the runtime (Hussey, 2010).

Process 2 – “AD Script Writing and Review” must fit the in/out cues according to the “Time – Cue Analysis” since the description is limited to the space available in the original video and a describer shall never talk over dialogue or commentary (ITC Guidance on Standards for Audio Description, 2000). It includes the following sub –processes: draft writing, draft review and editing, and synchronization of AD script to time code. For a 30-minute episode/film draft writing usually takes anywhere between four to six hours, and review and editing will usually approximately one hour (Hussey, 2010). Process 2 takes approximately five to seven hours.

The actual voice recording of the description (Process 3) entails reading the script within the available time frames using a microphone, which stores the AD content onto its internal memory. The narrator reads from the script and times the delivery of the audio to coincide with the timing and sound of the original film. This requires that the narrator vary the pace of description based on the allocated time to

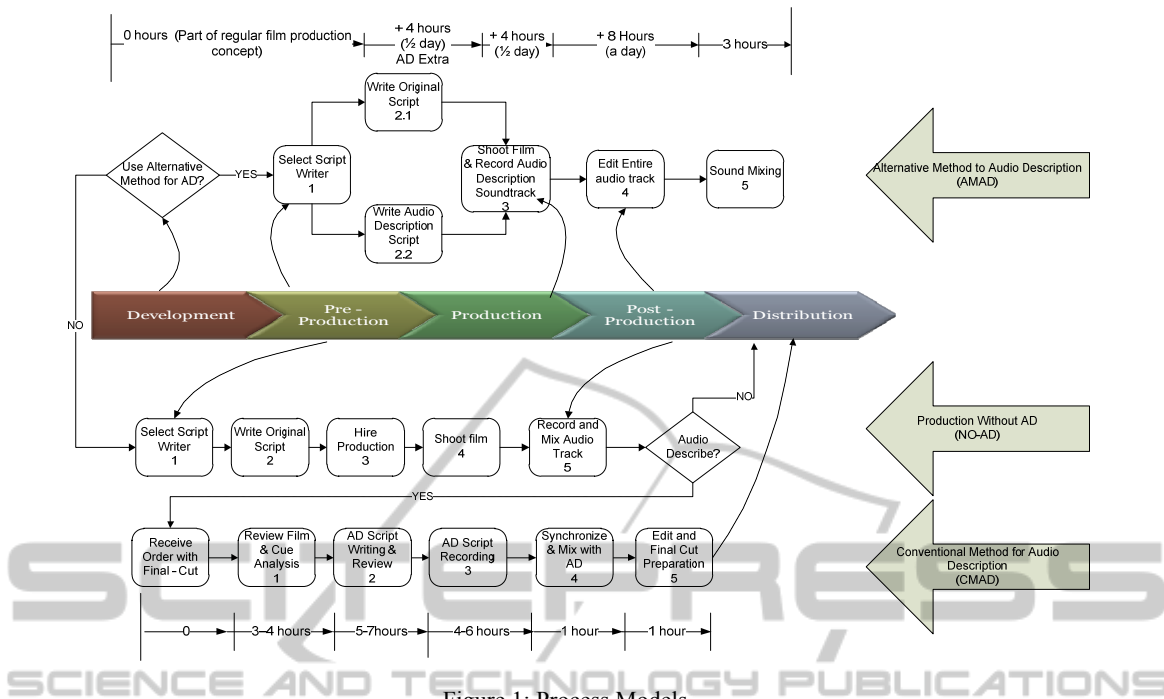


Figure 1: Process Models.

relay the script in the frame. On average it takes about 4 to 6 hours to record a script by a third party describer (Hussey, 2010). Since the AD script is on the microphone storage, the data must be transferred onto the computer in order to be synchronized and edited with the video. The transfer usually takes no more than fifteen minutes.

Process 4 – “Synchronization and Mix with AD” includes the following sub-processes: synchronization & editing, effect editing, mixing and mastering. Since recording does not take place with the native soundtrack, describer has to match description soundtrack and the video during synchronization & editing. Content precision and timing are critical during synchronization, which takes approximately fifteen minutes. During effect editing a describer changes the tones of the recorded voice, changes the setting to make the soundtrack “cleaner” and makes sure that the description “fits” with the “nature” of the video. This process also takes no longer than fifteen minutes. During mixing the describer adapts the volume levels of the description throughout the video, so the original soundtrack fades into the background. Mastering involves finalizing the AD soundtrack. Mixing and mastering both take a total time of approximately thirty minutes (Hussey, 2010).

In Process 5, the soundtrack from the audio description storage is exported to a new Completed Tracks Storage - where all completed projects await

distribution to clients. The process takes no longer than one hour. Next, the audio describer will deliver the product to the production company.

3.2.2 Alternative Method

In the Alternative Method, film production studio decides very early in the process, ideally in the development phase, whether their creative vision is going to be audio described or not. When a producer works on a vision he/she also shares the idea with the script writer/s, who includes description as part of script writing process. Being cognizant of the AD requirements; scripts writers can introduce pauses, scenarios and emotions in a way that allows the flow of the film to be smoother while offering a more enjoyable experience. Although that approach causes some delays during the production phase, it proves to be on overall much more cost effective than if AD was first introduced at post-production stage.

The situation when original and AD scripts are written in parallel is depicted in Figure 1 as Processes 2.1 and 2.2. Adding AD during the production phase does not have to be significantly more time consuming than if the script was created without AD. For example, in the Odd Job Jack case study, it took an additional half of a day to write AD script during the development stage. The entire script for the episode without the description was

written in approximately 5 days (Fels, Udo, Ting, Diamond, & Diamonds, 2006).

AD script can even be considered during pre-production phase, in which case everybody involved (actors, narrators or the directors) would be trained in how to create with universality in mind. If narrators voice over the raw shoots, which does not impact the time required to shoot the film or the need to get additional studio time. With effective planning after each scene is “shot” description can be added in-between and/or during next set preparations. As a result, adding AD may cause some delays, but again is not expected to add a significant overhead. In the case of “Odd Job Jack” AD was recorded once the show has been completed and it took an additional ½ day to voice the description. It has been noted from an interview with Smiley Guy Studio’s that AD script writing and voicing must take place due to the tight nature of the industry, and thus both soundtracks must be completed before they can be edited simultaneously.

In the Alternative Method, the AD film and the non-descriptive version can be edited simultaneously during post-production, improving the show production time. For the production of a 30-minute episode (Odd Job Jack case study), this process is expected to add approximately one more day.

Typically, sound mix follows recording and editing (Process 5). When Alternative Method is used, regular process timing will take as long as if the Conventional Method was followed. For example, in “Odd Job Jack” the process took 1 hour.

4 EVALUATION OF THE ALTERNATIVE MODEL

The evaluation of Alternative Method is conducted in three steps, which provide answers to the following questions:

1. Would the quality of a TV Show be compromised when the original creative team and production studio are responsible for AD development and integration?
2. Would the time required for key processes and therefore overall cost be higher if Alternative Method is used for adding AD?
3. Would a TV show Production Time be reduced if Alternative Method instead of a Conventional Method is used for adding AD?

4.1 Qualitative Analysis

The ultimate goal of producing an Audio Descriptive

film is the entertainment of the audiences. Qualitative Analysis, which is goal oriented and uses performance measures such as product or process quality (Bider, 2005), is used to answer the first question. Fels conducted a study, which compared the integrated AD process of a 1st person narrative vs. one that was created in a 3rd person style by a third party describing company. The two films were shown to an audience that evaluated the films on trust, opinion of description, preference, ease of use, and generic questions about AD (Fels, Udo, Ting, Diamond, & Diamond, 2005). The study clearly showed a preference to the audio described version in the 1st person. We use the evidence presented in that study to prove, that by allowing the original creative team to incorporate AD into the show production process, the quality of the end product will not suffer but quite the opposite, it will be improved.

The Conventional Method offers very limited interaction between the original creative team and the audio describing vendor. As a result, the consistency in the creative vision between the original producer and AD script is missing in externally described projects. Furthermore, as the script writer for “Odd Job Jack” found, creating descriptive audio script was fun and allowed him to “add more humor and material to the show” (Fels, Udo, Ting, Diamond, & Diamond, 2005). Thus from a qualitative metric, the in-house description of the film has definite advantages over a third party described film.

4.2 Quantitative Analysis

The results of the study are summarized in Table 1, where the Total Production Times required to complete the key processes are depicted in the last row. For a Conventional Method the total AD production process takes no less than 14 and no more than 19 hours, which must be added at the completion of NOAD process. The time required for integrating AD during the entire production process was approximately 17 hours. It means that AD related processes in an Alternative Method do not require more time than in a Conventional Method. The hourly rates for the in-house full time staff are usually lower than the subcontracting rates so the overall costs of adding AD by the production studios would prove to be cost effective. Since the case show was the first episode produced using the new method, those times should be even shorter for the following shows due the learning curve effect.

The Alternative Method proves to be

Table 1: Duration of key processes in NOAD, Conventional and Alternative Methods.

Process	NOAD	Conventional Method	Alternative Method
		Process durations represent times, which should be added to the NOAD process	
Review & Time-Cue Analysis	-	3-4 hours	This process is incorporated into the script writing and production of a video
Script Writing	5 days	-	
AD Script Writing & Review	-	4-6 hours	Additional 4 hours for AD to be added to NOAD process
AD Script Recording	-	5-7 hours	
Shoot Film and Record AD Simultaneously	-	-	4 hours
Synchronize & Mix (NOAD)	13 days	-	-
Synchronize & Mix w/ AD		1 hour	8 hours
Sound Mix & Format		1 hours	1 hour
Total Time		14 - 19 hours	17 hours

significantly more beneficial when the Show Production Times are compared. If a Conventional method is used then the time required for AD must be added to the total time for NOAD. In the case study it means that the show will be released for distribution almost 3 days later than if AD was not implemented. It makes the Conventional method ineffective, since it increases the Production to market time by more than 50 %. On the other hand, AD process in Alternative Method runs in parallel to the show production, having only slight effect on the show release time.

Alternative Method opens several possibility of advancing AD into an “audio film”, which can be experienced in the same way by visually impaired and a sighted audience (Lopez & Pauletto, 2009). It makes it possible to generate an “enhanced variable soundtrack” with different versions of the same script, where the description of the visual content will be portrayed through the eyes of different characters. It will encourage a viewer to watch the same film more than once and will enhance the value of a show.

5 CONCLUSIONS

The results of this study are encouraging since they demonstrate the potential of an Alternative Method to improve the quality, efficiency and effectiveness of AD process. The integrative approach to AD allows developing derivative products, such as “audio films” or “enhanced variable soundtracks”, which will increase a show value. A market study will reveal which product may succeed, what demographic may be interested and how much the AD costs can be offset by an increased revenue stream.

The limitation of this study is that although the Conventional Method is well understood and

therefore times required for production can be measured quite accurately, an Alternative Method was tested on only one 30-minute show. We are in the process of planning extensive testing of the method using an expanded case of a five-episode TV show, in order to establish detailed guidelines for early integration process and determine the impact of a learning curve on the overall production time during each episode.

More research is also required to determine what would be the break even for using the full time in-house AD describer instead of outsourcing. In order to fully assess the alternative model we also need to select a costing method, determine per-task cost and validate our current finding with an integrative analysis of cost, time, task and task adjustment.

This study provides results, which justify the effort and expense required to further investigate an Alternative Method. We hope that the further research will deliver the convincing evidence, which will allow implementing AD universally and enhancing the engagement of persons with visual disabilities.

ACKNOWLEDGEMENTS

Funding was generously provided by the Social Sciences and Humanities Research Council of Canada through the Community-University Research Alliance program. JP Udo provided support and advice in this project.

REFERENCES

Aguilar-Saven, R. S., 2004. Business process modelling: Reviewand framework. *International Journal of Production Economics* , 129-149.
 Ambler, S. W., 2004. *The Object Primer: Agile Model-*

- Driven Development with UML 2.0*. Cambridge: Cambridge University Press.
- Bider, I., 2005. Choosing Approach to Business Process Modeling - Practical Perspective. *Inconcept* (34).
- Canadian Radio - Television and Telecommunications Commission (CRTC), 2009. *Broadcasting and Telecom Regulations Policy CRTC 2009-430*. Retrieved May 22, 2010, from <http://www.crtc.gc.ca/eng/archive/2009/2009-430.htm>
- Connell, B. R., Jones, M., Mace, R., Mueller, J., Mullick, A., Ostroff, E., *THE PRINCIPLES OF UNIVERSAL DESIGN*. Retrieved May 22, 2010, from http://www.ncsu.edu/www/ncsu/design/sod5/cud/about_ud/udprinciplestext.htm
- Emiliani, P. L., & Stephanidis, C., 2000. From Adaptations to User Interfaces for All. *6th ERCIM Workshop "User Interfaces for All"*. Florence.
- Fels, D. I., Udo, J., Diamond, J. E., & Diamond, J. I., 2006. A first person narrative approach to video description for animated comedy. *Journal of Visual Impairment and Blindness*, 295-305.
- Fels, D., Udo, J., Ting, P., Diamond, J., & Diamond, J. (2005). Odd Job Jack described - a 1st person narrative approach to described video. *Journal of Universal Access in the Information Society*, 5 (2), 73-81.
- Fels, D., Udo, J., Ting, P., Diamond, J., & Diamonds, J., 2006. Odd Job Jack described: a universal design approach to described video. *Universal Access Information Society*, 73-81.
- Havey, M., 2005. *Essential Business Process Modeling* (1st Edition ed.). Sebastopol, CA: O'Reilly Media.
- Hill, J. B., Sinur, J., Flint, D., & Melenovsky, M. J. (2006, February 16). Gartner's Position on Business Process Management, 2006.
- Hung, R. Y., 2006. Business Process Management as Competitive Advantage: a Review and Empirical Study. *Total Quality Management*, 17 (1), 21-40.
- Kindler, E., 2004. On the semantics of EPCs: A framework for resolving the vicious circle. *Business Process Management: 2nd International Conference*. Potsdam.
- Ko, R., Lee, S., & Lee, E., 2009. Business Process management (BPM) standards: A Survey. *Business process modelling: Review and framework*, 15 (5).
- Lopez, M. J., & Pauletto, S. (2009). The Design of an Audio Film or the Visually Impaired. *Proceedings of the 15th International Conference on Auditory Display*. Copenhagen
- Miers, J., 1995. AD: seeing theater with your ears. *Information Technology and Disabilities*, 2 (2).
- Ouyang, C., Ter Hofstede, A., La Rosa, M., Rosemann, M., Shortland, K., & Court, D., 2008. Camera, Set, Action: Automating Film Production via Business. 1-9.
- Peli, E., Fine, E. M., & Labianca, A. T., 1997. Evaluating visual information Provided by audio description. *Journal of Visual impairment and Blindness*.
- Pettitt, B., Sharpe, K., & Cooper, S., 1996. AUDELTEL: Enhancing television for visually impaired people. *British Journal of Visual Impairment*, 48-52.
- Piety, P. J., 2004. The Language System of Audio Description: An Investigation as a Discursive Process. *Journal of visual impairment and blindness*, 98 (8).
- Russell, N., Van der Aalst, W., Ter Hofstede, A., & Wohed, P., 2006. On the Suitability of UML 2.0 Activity Diagrams for Business Process Modelling. *Proceedings of the 3rd Asia - Pacific Conference on Conceptual Modeling*, 53, pp. 95-105.
- Schmeidler, E., & Kirchner, C. Adding Audio Description: Does It Make a Difference? *Journal of Visual Impairment & Blindness*, 95 (4), 197-212.
- Snyder, J., 2007. Audio Description: The Visual Made Verbal. *The International Journal of the Arts in Society*, 2.
- Statistics on the Blind*. (n.d.). Retrieved May 22, 2010, from New media Journalism: <http://apps.fims.uwo.ca/NewMedia2007/blindstats.asp>
- Udo, J., & Fels, D. I., 2009. Re-fashioning fashion: An exploratory study of a live audio described fashion show. (17).
- Udo, J., & Fels, D., 2010. Universal design on stage: Live audio description for theatrical performances. *Perspectives: Studies in Translatology*, 189-203.
- Van der Aalst, W. Formalization and Verification of Event-driven Process Chains. *Information and Software Technology*, 41 (10), 639-650.
- Van der Aalst, W., Aldred, L., Dumas, M., & ter Hofstede, A., 2004. Design and implementation of the YAWL system. *Proceeding of the 16th International Conference on Advanced Information Systems Engineering*.
- Van der Aalst, W., Ter Hofstede, A., & Weske, M., 2003. Business Process Management: A Survey. *Proceedings of the Business Process Management*, 2678, 1-12.
- Wohed, P., Van der Aalst, W., Dumas, M., ter Hofstede, A., & Russell, N., 2006. On the Suitability of BPMN for Business Process Modelling. *Business Process Management*, 161-176.