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PBS transition from analog to digital TV broadcasting: the human perspective

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Carolyn A. Colborn
Cross-Disciplinary
Program of Study (CDPS)
Capstone Project
February 26, 2004

Title: PBS Transition From Analog to Digital TV Broadcasting: The Human Perspective

Clients: Kent Hatfield, Vice President, Technology & Operations, WXXI
Fran Lipani, HR Director, WXXI

Mentor: Jay Moldenhauer-Salazar, Ph.D. Sun Microsystems, Inc. HR Labs

Customers: PBS Viewing Audiences

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The Challenge

In 1996 the Federal Communications Commission (FCC) set a mandate for the transition time table for non-commercial television broadcasters to begin digital broadcasting by May 2003 or risk losing their license. One consequence of this mandate is the challenge of managing an organization through a technological transition. A second consequence of this mandate is the need to educate the viewing public on understanding and utilizing the new technology.

Purpose of the Project

The purpose of this project is to examine a subset of Public Broadcasting Service (PBS) stations in how they made their transition to digital broadcasting to:

1. Identify candidate best practices for successfully transitioning from analog to digital broadcasting,
2. Make recommendations on how to educate the viewing audience on adapting, understanding, and utilizing Digital TV (DTV), and
3. Identify possible areas where further research might assist in a better understanding of how to manage change effectively.

Role of Mentor

Jay Moldenhauer-Salazar, Ph.D., HR Labs, Sun Microsystems, Inc. was the project mentor. In this role he provided guidance in methodology, sampling, sample size, managing scope of the project, randomness, and appropriate treatment of confidential information.

Methodology

Utilizing a survey of open-ended questions sent by U.S. mail and a random number generator to select a sample size of approximately 40% ^(Note 1) select PBS stations from a nationwide (and Puerto Rico) population, and aggregate the responses.

Determining Scope of the Project

From a snapshot of TV stations broadcasting digitally¹, the following number of network broadcasting stations were identified:

141	-	ABC
140	-	CBS
141	-	NBC
174	-	PBS
99	-	FOX
90	-	IND
53	-	UPN
50	-	WB
28	-	PAX
10	-	Telemundo
9	-	Univision
3	-	Educational
1	-	HSN
939		Total

Based on discussions with WXXI's Vice President of Technology and Operations, Kent Hatfield, on the likelihood of finding any best practices due to high variability amongst the networks outside of PBS, we agreed to focus only on the PBS network.

Note 1: Since the original snapshot was made on July 28, 2003, additional transmitters went live afterwards, thus increasing the size of PBS transmitters to 229².

Data Collection

Utilizing the Internet, 87 random numbers³ were generated between 1 and 174, producing 17 duplicate numbers. This produced 70 unique transmitter locations, 40% of the targeted population in 32 states. By using AOL Google and switchboard.com search engines⁴, physical addresses for these transmitters were identified and collected, and a database of mailing labels was created.

Survey Design

For each of the following course offerings, the researcher developed questions to determine how PBS stations made the transition from analog to digital broadcasting:

- Organizational Behavior and Organizational Development
- Strategic Human Resource Planning
- Human Resource Development and Small Group Communications
- Human Resource Management
- Marketing
- Finance and Economics

focusing on the following areas:

- Training PBS employees
- Educating the viewing audience
- Implementing the transition from analog to digital
- Costs
- Productivity

Implementation

The following attributes were identified for query:

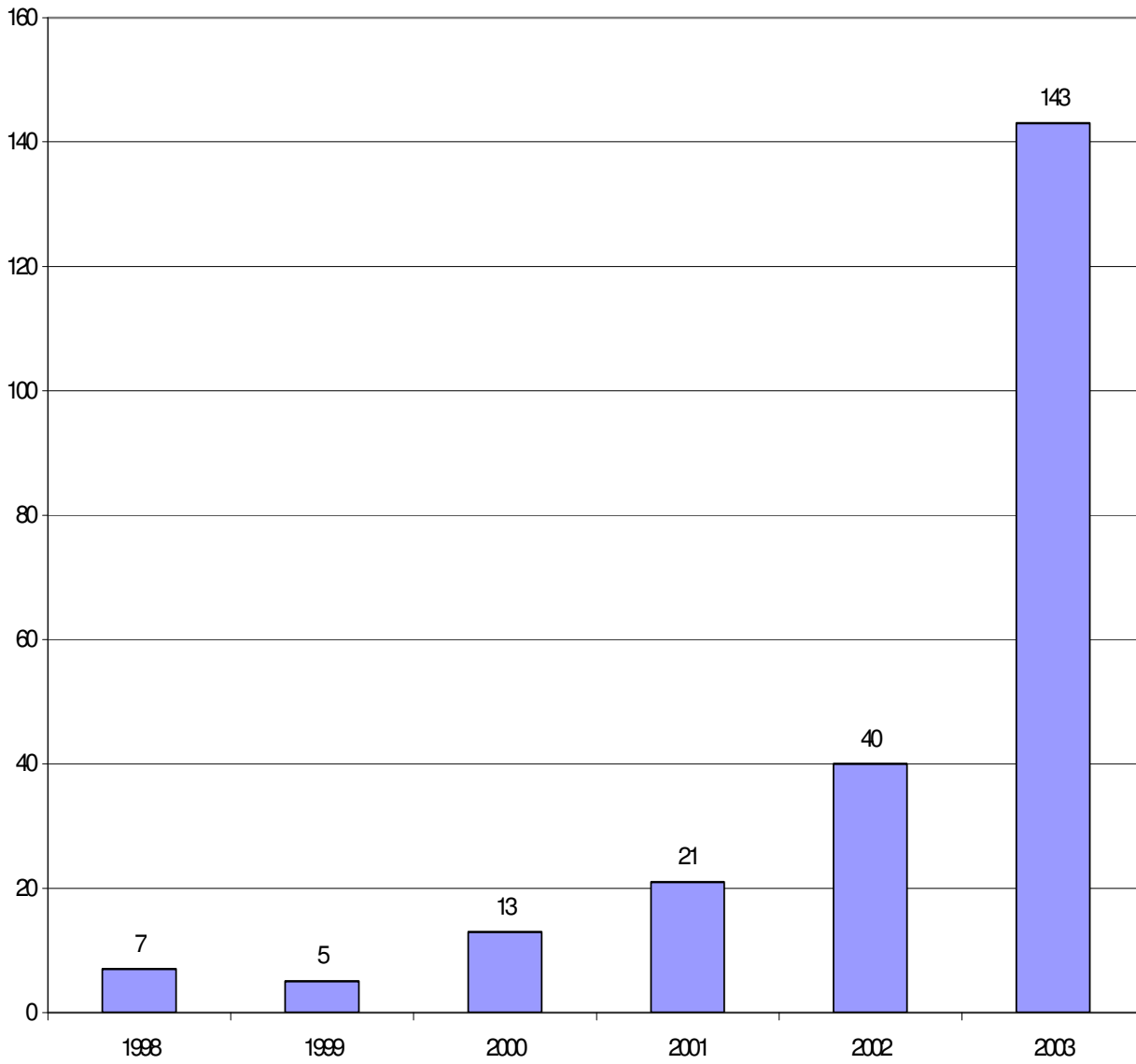
- Timeframe
- Outside assistance for technology and / or fund-raising
- Use of best practices
- Staffing
- Job design
- Recruiting
- Organizational structure

In addition to the U. S. mail surveys, phone interviews were conducted with Chuck Mellone and Brian Gibbons, U.S. Department of Commerce, who work with all the PBS stations on funding, and Ed Williams, Senior Engineer DTV Services Group, PBS Corp.

Types of PBS Licenses⁵

- Community (i.e. WXXI)
- University & College
- School Board
- State Operated

Number of PBS Digital Transmitters Going Live² 1998 - 2003



Results of the Survey

Respondents covered the west coast, southwest, mid-west, south, mid-Atlantic, and northeast, representing 13 states, which is 41% of the states in the survey sample. 57% responded by U. S. mail; the remaining 43% responded online via email. Over 35% of the states responding are state operated; over 40% of the states responding are community operated; the remainder came from universities or school board licensed PBS stations. Of the respondents, 50% had household viewing area of one million or greater. The number of full time employees ranged between 20 – 210. The Median is 84. The number of part time employees ranged between 2 – 45.

Attitude Towards Change

The researcher would like to preface the results of the survey with some of the comments that were made by Presidents, Chief Executive Officers (CEO), Chief Operating Officers (COO), Vice Presidents (VP), Chief Technology Officers (CTO), Managers, and Directors, who are the respondents. The researcher believes this highlights the spirit of the Public Broadcasting Service in embracing new technology and in embracing change positively.

(We) "... converted from a legacy broadcast facility, almost 30 years old to a new state of the art facility. Much of the basic infrastructure had to be rebuilt while maintaining on-air operations. Much planning and coordination were involved in this conversion. Many different departments were involved... requiring support from other top level managers."

- VP

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“We... pretty much set the standard for digital broadcasting.”

-VP

“This is a very exciting time to be in the broadcasting business.”

- Manager

“We are excited about it. While it was costly and unnerving to plan and implement and we have not totally worked out all the kinks, it was necessary for us and the TV industry to remain viable.”

- COO

“Wasn’t as bad as we thought. Can’t wait to see digital come into its own and to learn all the possibilities it can offer. We have just scratched the surface. The best is yet to come.”

- President and CEO

Outside Assistance in the Transition

The researcher’s survey, Appendix B, asked if outside assistance in technology and / or in fundraising was utilized in the transition from analog to digital broadcasting.

64 % of the respondents utilized outside technical assistance, highlighting assistance in highly specialized areas such as structural changes, production facility-interconnect systems, frequency determination, physical environmental systems, legal, transmitters

and wave guides. The assistance came from consultants, vendors, manufacturers, and PBS.

Funding for PBS stations comes in five major categories:

- Federal government
- State
- Local corporate support
- Major donors
- Viewing audience

Respondents who highlighted outside assistance in fundraising identified use of professional lobbyists in passing state legislation for funding, hiring consultants to do a feasibility study on their capital campaign and hiring consultants to help design their capital campaign.

14 % of the respondents sold bonds, raising over \$8 million.

Staffing

50 % of the respondents said there was no change in staffing during the transition from analog to digital broadcasting.

14 % increased staff size by one or two full-time equivalents (FTE), and

29% decreased staff size, although half of these respondents said the decrease was not attributed to the conversion.

7% indicated a temporary increase in staff size during the transition.

Change Management

While the survey did not specifically ask for approaches to managing change, some respondents offered comments regarding how they managed the change. It was noted that not everyone was willing or able to make the transition, and in those situations, they were replaced. One VP commented that utilizing the exercise of asking people to write their own job description was a useful change management tool.

How Did Jobs Change?

79 % of the respondents redesigned existing jobs.

36 % created new jobs.

29 % recruited new staff.

36 % made organizational changes.

Redesigned Jobs

Of those respondents who redesigned jobs, the most frequently mentioned job was master control operations, (MCO), which now has more channels to manage:

“Master control operations... needed to become more computer literate. They transitioned from button-pushers and tape loaders to programming automation managing files on servers. Also, the lines have blurred between the technical personnel and our IT department. While they are still under separate and distinct units (both are under the engineering dept.), their duties and skills often cross.”

- VP, Engineering

The fact that quality control (QC) functions were pushed upstream was also noted:

“The MCO now does more pre-checking avoiding problems rather than reacting to them in real time. The ingest persons role is more QC oriented, etc. Program guide more tightly automated, PSIP functions more tightly automated, ATSC encoder control more tightly automated, satellite recvr [sic] pointing and tuning more tightly automated.”

- CTO

36% of the respondents noted a workload increase. One respondent qualified the workload increase by stating the workload has been streamlined and automated.

Other roles that changed include the following: librarian, tape operators, studio staffers, operations managers, traffic supporter, studio manager, education director, broadcast engineers, editors, IP operators, and grant writers.

Recruiting Outside Staff

14 % of the respondents hired someone to lead the transition from analog to digital broadcasting.

7 % hired managers to supervise operations during the transition.

Other positions hired were in traffic, grant writing, and major gifts.

Organizational Change

One respondent noted that while no organizational changes occurred, IT and technical staffs are working more closely now than they did a few years ago. Of the respondents that did make organizational changes, all of the changes were in combining two or more departments:

- Marketing and development,
- Education and outreach,
- IT, traffic and broadcast engineering were combined to technology.

Operational Costs

93 % of the respondents noted an increase in annual operations costs, most frequently citing electricity required for the transmitters. The range of annual cost increase cited was from \$5,000 to over \$1 million. The remaining 7% cited annual cost savings due to reduction in staff size.

14 % of the respondents anticipate a cost savings once analog is turned off.

Use of Best Practices

29% of the respondents did not look for best practices, as they were the early adopters.

“We did this on purpose. We felt that this was so different from our past that we needed to design what was never a past best practice. Our systems are IT based, not broadcast.”

- COO

Of those that looked for best practices over time, they looked to those who were further along in the conversion process, networking amongst other PBS and commercial stations and with cable companies. They looked to the FCC, PBS, CPB, APTS, and industry groups such as the NAB, SBE, IOWA, vendors and manufactures, consultants, conventions, trade shows, conferences, and trade publications.

How Training Was Provided

In particular, the early adopters cited reading books. One respondent cited these books:

Digital Television Fundamentals, McGraw Hill

PSIP: Program and System Information Protocol, McGraw Hill

Fundamentals of Digital Television Transmission, Wiley

Interscience (transmitter engineers only)

They assigned readings amongst themselves and taught each other from what they read.

They also read trade publications. The PBS email system and discussion boards were highly utilized. APTS, NAB, IOWA, PBS Express Online and other professional development conferences were cited as sources of learning.

According to Chuck Mellone, Public Television Funding, U. S. Department of Commerce⁶, people would arrive three to four days early for the NAB conference and hold roundtable discussions on topics of mutual interest.

Some respondents indicated that training was provided by vendors, manufacturers, and / or consultants. One respondent said training was provided “hands-on, offline, with a first line supervisor.” Another stated, “All engineering staff members were provided outside training on certification of computer industry accepted A+ and Network+ exams. All engineering staff is expected to obtain certification. Cost was \$3,000/ employee.”

Over time, the use of best practices became more pervasive, albeit informal, networking amongst other PBS stations, commercial stations, and with cable companies.

Educating the Viewing Audience

14% of the respondents said they have no current plans to educate the viewing audience.

One respondent stated that they are waiting to move into data and interactive video before they make plans. One respondent stated the best way to do this is for all television stations in their market to coordinate the activities, and they are just waiting for a critical mass of viewers.

Of the respondents who do have plans, those plans include community outreach activities, printed materials, use of their educational channels, radio specials, cross-promotion with cable companies, and their web sites.

Printed materials included information cards distributed to local retailers, program guides, ads in local papers, magazine ads, and inserts in monthly newsletters.

Outreach activities included “CEO on speaking circuit with DTV demo,” digital luncheons with small groups and live DTV demos, a focus on community leaders, and live demonstrations at various civic contact points.

One respondent stated that they offer a reception in their station to early adopters of DTV. They have an “extensive HDTV ‘alert’ list (informing HD and digital users of what’s coming and how to use it).”

Most Useful Skills and Knowledge

From my degree program, the most useful skills and knowledge to produce this project are:

- **Communications Preferences**

Drawing from Organizational Behavior, identifying communications styles, patterns, and preferences was extremely useful in determining the best ways to communicate with my mentor, who is located out-of-town as well as my clients, who are local.

My mentor preferred a once-a-month phone call with low volume email exchange in the interim with a week turnaround time response. My technical client checks his messages once per day with a general turnaround time of at least a few days, and he agreed to several one-on-one meetings over the course of the project.

- **Learning Preferences**

Drawing from Theories of Human Resource Development, different people have different learning style preferences, as the surveys identified.

- **Empirical Methods and Applied Data Analysis**

The means by which data was collected and interpreted.

Lessons Learned

My instructor for Organizational Development frequently quotes Dr. Edgar H. Schein, Professor of Management Emeritus at MIT Sloan School of Management, who is considered to be the first to define the field of organizational psychology. He advises people in this field to “assess your ignorance.” In context, it is advice for assessing whether or not one should take an assignment on the basis of the expertise he or she brings with him or her. There are some bodies of knowledge where people can easily distinguish what they are ignorant about, but there are also times when one does not realize he or she is ignorant about a subject matter until something happens to make him or her aware of his or her ignorance. This can be embarrassing. I started this project with my list from the NAB of 939 transmitters, assuming there is a one-to-one relationship between the call sign (i.e. WXXI) and the broadcasting station. I became aware that this was not true after I mailed 68 surveys and called one of the stations in search of the two “stations” I could not find through Internet searches. That is when I learned that there can be a one to many relationships between a broadcasting station and the transmitters, as identified by the call letters. The station I called owns three transmitters. According to Ed Williams at PBS, there are 175 licensees, and 355 transmitters. Three respondents indicated that they accounted collectively for 15 transmitters. I think I am the only person who tried to interview a transmitter, and I did not even know it. I hope the people in the PBS network will kindly forgive my ignorance on this matter.

Since WXXI is a community PBS station, I assumed all PBS stations were community stations. I did not realize until I began searching for addresses that some PBS stations are state licensed, and so forth, as I have earlier described. Brian Gibbons, U.S. Department of Commerce, NTIA kindly provided guidance on making the distinctions between the different types of licenses⁷.

My biggest lesson learned is how difficult it is to describe my cross-disciplinary degree when people ask, “What is your degree in?” As Dr. James Myers’ remarked in the RIT 2002 – 2003 Annual Report of the Center for Multidisciplinary Studies, “I cannot count the number of times I have been asked this question.” I half-jokingly call it “the degree that nobody but me understands.” Like Dr. Myers, I too have a different answer depending on who is asking the question. For the subject matters that I pursued in this degree, my inquirer may have knowledge of the subject matters ranging from none to expert. It is an art to try to gauge the level of understanding of the person with whom I am engaged on this question to determine how to respond.

Recommendations

I would like to preface my recommendations with a proviso that it is humbling to me to have accessed the brainpower and high spirit of the people in the PBS system. I frankly do not think I can add more than what I have collected from the respondents. As I told Kent Hatfield in the beginning of this project, “WXXI is doing so much, what can I possibly add to that?” We did talk about live demos in public: at malls, retail stores, and sports bars.

My personal favorite is the “digital luncheon,” which came in from one respondent (and it was not WXXI), reminding me that this is how I met Norm Silverstein, president and CEO of WXXI. Were it not for that digital luncheon, I may not have found the opportunity to produce this project.

I am a firm believer in “one size doesn’t fit all,” and this paper has demonstrated the many ways in which the people within PBS taught themselves and each other. It highlights people’s learning preferences and communications preferences.

Since my project has collected the ways in which a subset of PBS across the United States has transitioned from analog to digital broadcasting, I would like to suggest that if there is interest in this paper by the NAB, APTS, and / or PBS that they contact me for copyright permission to post what they find of value from it on their respective web sites.

Potential Future Research

There may be a relationship between the role of a person within the organization (i.e. broadcast engineer) and his or her preferred learning and / or communications methods (i.e. discussion boards, reading), but further research would need to be done to test if there is a correlation between role and learning/communications preferences.

I conducted this study in search of “Candidate Best Practices.” I would say to qualify as a “best practice,” another iteration of feedback from PBS would need to be conducted. Kent Hatfield suggested this should be done by peer groups, for example, market size, type of license.

How Is This Project to Be Evaluated?

Since the nature of this project is performing a service, there is a challenge in defining the value of the service. I would say the first level of evaluation was during the piloting of this survey, where I gave my client permission to throw out every single question. Not one question was removed from the pilot.

The second level of evaluation I would say is the response rate I received in a short timeframe. The survey was mailed January 22, 2004, with a request to respond by January 31, 2004. As CEOs, VPs, and managers are busy people, I am pleased and thankful for the number of responses I received (14 made the deadline).

The third level of evaluation I would say is of the number who did respond, how many are interested in the findings? 85 % of the respondents requested the results.

Now, while I am obligated to maintain confidentiality to the respondents of my survey, results are public, and the folks in the PBS network are highly collaborative. With the NAB conference coming up in April (if not sooner), I am sure some of my respondents will claim their quotes from this paper.

Since I am being graded on this project, I will conclude the results of this study by providing the reader with a testimonial:

“You’ve asked some good questions. Training has always been a problem, and DTV and the transition to digital has made it more so. The transition to DTV has been slower than anyone has anticipated, and operating costs are significant for a service that has few viewers and no revenue stream.”

- VP Engineering

Lastly, my client and my mentor are to provide feedback to RIT. Their feedback will be used in assigning a grade for this project.

Acknowledgements

I would like to thank the following people who made it possible for me to do this project to complete this degree:

Norm Silverstein, President and CEO, WXXI

Kent Hatfield, Vice President of Technology and Operations, WXXI

Fran Lipani, Director of Human Resources, WXXI

Confidential respondents from PBS stations across the U. S.

Chuck Mellone, Public Television Funding, U.S. Department of Commerce

Ed Williams, Senior Engineer, DTV Services Group, PBS

Brian Gibbons, NTIA, U.S. Department of Commerce

Jay Moldenhauer-Salazar, Ph.D. HR Labs, Sun Microsystems, Inc.

Ellen Kowalski, Ph.D. Adelphi University

My instructors

My mother and father, family, friends, and classmates

Citations

1. Data downloaded from www.nab.org as of 7/28/2003
2. Data downloaded from www.aps.org as of 1/17/2004
3. www.random.org/inform.html
4. Individual and collective web sites for various PBS stations
5. E. Williams, Senior Engineer DTV Services Group, PBS Corp.
(Personal communication, January 29, 2004)
6. C. Mellone, Public Television Funding, U. S. Department of Commerce
(Personal communication, January 19, 2004)
7. B. Gibbons, U. S. Department of Commerce, NTIA
(Personal communication, February 4, 2004)
8. RIT Center for Multidisciplinary Studies Annual Report 2002 – 2003
9. PBS respondents
10. FCC.GOV

Appendix A

Cover Letter to Survey

Rochester, NY
16 January 2004

To: TV Station Manager

Re: **Masters Degree Research**

My name is Carolyn Colborn, and I am a graduate student at Rochester Institute of Technology (RIT) in Rochester, NY. I am currently pursuing a cross-disciplinary masters degree and am hoping you will agree to participate in my research.

Purpose of the Study:

With the Federal Communications Commission mandate for broadcasters to convert from analog to digital broadcasting, I am interested in learning how stations made this technological transition (if it has already been completed). Specifically, my aims are to:

1. Identify candidate best practices for successfully transitioning from analog to digital broadcasting.
2. Make recommendations on how to educate the viewing audience on adopting, understanding, and utilizing Digital TV (DTV).
3. Identify possible areas where further research might assist in a better understanding of how to manage change effectively.

The survey should take no longer than 15 minutes to complete, and all research will be treated confidentially and aggregated by demographics. In return for completing the survey, you will receive a full report of my research results outlining candidate best practices in the transition from analog to digital broadcasting and the corresponding recommendations.

Please forward my note to whomever you think might be appropriate (ie. your HR director or chief engineer) to respond by Jan. 31st, 2004.

I have included my full project proposal as well as a copy of the survey questions.

Thank you in advance for your help.

Responses can be directed to my email address CarolynAColborn@aol.com

Sincerely,
Carolyn A. Colborn

Appendix B

Survey Instrument

**Confidential Survey
on Transitioning From
Analog to Digital TV Broadcasting**

The purpose of this survey is to identify candidate best practices for successfully transitioning from analog to digital broadcasting. It will take no longer than 15 minutes to complete, and all research will be treated confidentially and aggregated by demographics.

Demographics

1. What is your title?
2. How many households are in your viewing area?
3. What is the U.S. state in which your station resides?
4. How many full-time / part-time people are employed by your station?
Full-time: Part-time:

Survey Questions

1. What year, month did your station begin converting from analog to digital broadcasting?
2. What year, month did your station complete converting from analog to digital broadcasting?
3. Did your station have outside assistance technically or in fund raising (from vendors, consultants, college or university, or other) in the conversion? If yes, please explain.

**Confidential Survey
on Transitioning From
Analog to Digital TV Broadcasting**

- 2 -

4. Did your station seek any industry “best practices”? If yes, what were they and where did your station find them?

5. Does your station have plans to educate your viewing audience on understanding and utilizing DTV? If yes, please explain how you intend to do so.

6. How was training provided to your station's staff?

**Confidential Survey
on Transitioning From
Analog to Digital TV Broadcasting**

- 3 -

7. Was there an increase or decrease in your station's staffing that you attribute to the conversion? If yes, by how many full-time equivalents (FTE)?

8. Did your station create / design any new jobs as a result of the conversion? If yes, please explain.

9. Did your station re-design any existing jobs as a result of the conversion? If yes, please explain.

10. Did your station recruit any new staff as a result of the conversion?

11. Did the transition affect your station's organizational structure? (e.g. a new department was created, two or more departments were combined into one?) If yes, please explain.

12. Was there an increase or decrease in your station's operational costs that you attribute to the conversion? If yes, by how much?

13. Did your station realize (or expect to realize) any cost savings as a result of the conversion? If yes, please explain.

**Confidential Survey
on Transitioning From
Analog to Digital TV Broadcasting**

- 4 -

14. May I contact you to clarify your responses?
(If yes, please provide email or phone number)
15. Are you interested in an aggregated summary of the results of this survey?
(If yes, please provide email or physical address)
16. Is there anything further you'd like to comment on about your station's transition
from analog to digital broadcasting?

Thank You for Your Time.

Responses can be directed to my email address CarolynAColborn@aol.com
Electronic form of this survey available upon request. Please put "Capstone" in
the Subject Line.

Appendix C

Definitions

Definitions

FCC Federal Communications Commission, created in 1934 to regulate all broadcasting

PBS Public Broadcasting Service, a non-commercial broadcaster wholly owned by its station affiliates

NAB National Association of Broadcasters, a full-service trade association, which represents the interests of over-the-air radio and television broadcasters. The NAB Education Foundation (NABEF) was created to conduct research, education, and other activities related to broadcasting and its impact on the nation.¹

APTS Association of Public Television Stations is a non-profit membership organization established in 1980 to support the continued growth and development of a strong and financially sound noncommercial television for the American public.²

SBE is the Society for Broadcast Engineers

CPB is the Corporation for Public Broadcasting

NTIA is the National Telecommunications Information Administration