Television Network Development: The Early Years

Stewart L. Long
California State University, Fullerton

Although the potential for television broadcasting had been there for as long as radio broadcasting had been in existence, the more complex technical problems involved, along with the reluctance of the Federal Communications Commission (FCC) to allow premature television systems to be foisted upon the public, resulted in delaying the first commercial television broadcasts until 1941. Then World War II intervened and it was not until 1945 that television activity once again started to expand. In 1946 the first network television broadcasts took place and by 1948 the industry seemed ready to embark on an explosive growth period. However, a number of problems had arisen as the television broadcasting industry expanded, the most important of which were the questions of how to allocate the available spectrum of space and what technical standards to adopt for the industry. The technological and regulatory aspects of these two questions became the determining factors of television network development in the early years.

EXPERIMENTAL TELEVISION

Experimental television broadcasts using a variety of mechanical and electronic systems took place in the 1920s and early 1930s.[1] The Federal Radio Commission in its last report in 1933 noted with satisfaction that "much progress has been made in the laboratory," but added that "visual broadcasting is still in the experimental stage" [12, p. 31]. In 1934 the FCC, created by the Communications Act of that year, inherited the guardianship of the experimental television situation. Television development continued to progress slowly, until Radio Corporation of America (RCA) successfully demonstrated an electronic television system at the New York World's Fair in 1939. Suddenly the FCC found itself with a number of applications for frequency assignments on which to engage in commercial television broadcasting [10, p. 45].

As a result the commission set up a special committee to study

the various aspects of television broadcasting and to recommend a policy which might serve as a guide to the industry. The committee's report, issued in May of 1939, stated that the FCC faced "a most complex problem of engineering, economics, and sociology," and in language that was to provide the foundation for many of the commission's future actions recommended caution lest "premature decisions... which might later prove to hamper the orderly development of the industry [be made]... by administrative fiat to freeze the art at this stage of its development."[2] While the FCC was thus being counseled to continue the period of experimental broadcasting, industry pressures were mounting to commercialize the new medium. Radio Corporation of America, which had spent over $9 million on television research and development [5, p. 206], requested that the FCC relax its rules banning commercial sponsorship of programs on experimental television stations. The FCC, heeding the warning against premature decisions concerning the industry's development, denied the request in November of 1939 [11, p. 147].

However, industry clamor for commercialization, now coming from the Columbia Broadcasting System (CBS), DuMont, Philco and others, as well as RCA, grew even more intense. The commission responded with a decision to permit "limited commercialization" beginning on 1 September 1940. But perhaps feeling that CBS and RCA's dominance of commercial radio would spill over into television, the FCC emphasized that station licenses "were still experimental... and full commercialization would not be permitted until 'genuine and healthy competition' in television could be assured."[3]

The commission soon realized, however, that it had erred even in this first tentative step towards allowing the commercialization of television broadcasting. Its mistake involved what has been called the "lock and key" relationship of television transmission and reception. Television sets, unlike radios, must do more than merely pick up and amplify the signal being broadcast. They must also carry out a precisely timed scanning sequence in exact synchronism with the television camera. Unless both transmitter and receiver operate on the same line and field frequencies, and unless the receiver is designed to receive and interpret specific synchronizing signals, the transmission will not be picked up on the receiver; that is, "the key will not fit the lock" [3, p. 185].

The FCC in deciding to allow limited commercial operations had not adopted any uniform technical standards for television transmitters and receivers. Its reasoning seems to have been that to do so might freeze television technology at this primitive level, since the public might acquire a strong vested interest in maintaining the system of standards which fit the equipment they had already purchased in this period of limited commercialization. What the FCC failed to see, but which became apparent when RCA began a marketing blitz to sell its television apparatus before commercial operations commenced, was that a de facto set of standards, based upon the system used by the company selling the most apparatus,

might easily come into being [3, p. 192].

Realizing its error, the commission withdrew its decision to allow limited commercial telecasting in May of 1940; but in the face of certain industry protest, it promised approval of full commercialization as soon as uniform technical standards could be decided upon. Again, however, it stated its commitment to a television system organized so as to provide "genuine and healthy competition" within an unfettered industry, and not a mere semblance of competition [11, p. 152]. So that no company could unduly influence its decision, a new industry-wide committee of engineers, the National Television System Committee (NTSC), was set up to recommend technical standards.[4]

COMMERCIAL TELEVISION BROADCASTING BEGINS

Nearly one year later the FCC announced the technical standards (based largely on proposals of the NTSC) which were to be adopted for the television industry. Full commercial operation was to be authorized on 18 very-high-frequency (VHF) channels, each six megacycles wide, located between 50 and 294 megacycles on the broadcasting spectrum band. Television stations would broadcast 525 line pictures at a speed of 30 frames per second [13, p. 18]. These standards provided for the transmission of black and white pictures only, despite CBS's contention that color television was already technically feasible.

The first stations to get commercial licenses were two experimental ones owned by the leading radio networks, NBC's station W2XBS in New York City, and CBS's station W2XAB, also in New York [11, p. 153]. Numerous other companies applied for new commercial licenses or to have their experimental station licenses converted to commercial ones. However, before commercial television could get off the ground, World War II broke onto the scene, and in the spring of 1942 all production of civilian radio and television apparatus was halted; and whereas World War I, through the government's supervision of the radio industry, speeded up the eventual development of commercial radio broadcasting, World War II substantially delayed the further development of television and thus of the eventual development of commercial television broadcasting. The reason for this contrast is quite simple. Radio was seen by the government as an essential communication service for a war effort, but television (at least from the vantage point of 1942) was seen as a superfluous service needing to be curtailed in order to free broadcasting spectrum space for more critical needs. Thus, while in May of 1942, 10 commercial television stations had been on the air and several others were under construction, by September of 1944 only six stations were still functioning, and even these were on severely curtailed broadcasting schedules of four hours per week [13, p. 18]. Outside of New York City, only Philadelphia,

Chicago, and Los Angeles had television service [14, p. 41].

POSTWAR DEVELOPMENTS

The FCC, anticipating a postwar expansion of commercial television broadcasting, in August of 1944 started general allocation proceedings to determine the needs of nongovernmental services for frequencies in the broadcasting spectrum [13, p. 18]. One of the thorniest problems to be resolved was just where in the spectrum commercial television should be located. Previously the authorization had been on 18 VHF channels between 50 and 294 megacycles, but World War II had greatly expanded government demands for frequencies in this portion of the spectrum. Therefore it was felt by the commission that only 13 channels in the VHF band could be made available to commercial television when the war ended. In light of this new situation, some industry spokesmen, led by CBS, contended that the best place for commercial television was in the Ultra High Frequency (UHF) band between 480 and 890 megacycles where more spectrum space was available. While the FCC itself realized that there was insufficient spectrum space in the VHF band to provide a truly competitive nationwide television system, it was reluctant to affect adversely the interests of the television pioneers on station allocations below 300 megacycles. As a consequence it made the first in a series of compromise decisions which contributed heavily to the eventual noncompetitive industry structure which it had explicitly stated it wished to avoid. This decision was that commercial television was to continue on the 13[5] available VHF channels, but in addition the UHF band would be assigned to experimental television. It noted that it ultimately expected television to be located in this upper frequency when all the technical problems of its utilization had been worked out [13, p. 19].

Contrary to expectations, this decision and the subsequent resumption of station licensing did not lead to a great upsurge in television activity. Part of the problem stemmed from postwar materials shortages which delayed any massive effort to manufacture television apparatus; but perhaps more important was the FCC's own equivocating position concerning the VHF versus UHF controversy and the continually recurring question as to whether or not color television was already technically feasible. Since the two positions on each of these questions seemed imcompatible (at least from the technological viewpoint of the mid-1940s), a choice in each case would eventually have to be made. Therefore, television manufacturers and potential station licensees, unwilling to choose a system which might later be abandoned, preferred to wait for further clarification of the issues [3, p. 193].

The issues were brought to a head in September of 1946 when CBS filed a petition requesting approval of commercial television

broadcasting in color and in the UHF band. Despite massive publicity which CBS gave its color system, it became clear during the commission's hearings on the request (which included demonstrations) that color television was far from being perfected. In March of 1947 the FCC denied CBS's petition [13, pp. 20-21].

This decision, although providing for further experimentation in color and UHF broadcasting, seemed to remove much of the hesitancy on the part of those considering entrance into the television field. Additionally, the postwar shortages of strategic raw materials were ending, and whereas only 6,476 television receivers had been produced in 1946, over 178,000 were produced in 1947 [9, p. 28]. The time seemed ripe for a "take-off" period in the television industry.

TELEVISION NETWORK INTERCONNECTION

Unlike the interconnection of radio networks which took place via telephones, or even in some cases via telegraph wires, the link-up of television stations into networks required special cables built especially for this purpose.[6] As early as 1936 the FCC had authorized the construction by the American Telephone and Telegraph Company (AT&T) of coaxial cables between New York and Philadelphia to be used in part for the experimental transmission of television signals [11, p. 158]. On 9 November 1937 the first television pictures and sound were transmitted over the newly installed cable. After several experimental broadcasts over the cable in 1938 and 1939, the 1940 Republican national convention was televised in Philadelphia and transmitted to New York via the cable for broadcast there [11, p. 159]. By the end of 1941 additional cables had been built between Washington, D.C. and Baltimore, and between Baltimore and Philadelphia, but the interconnection stopped there with the onset of World War II.

Even before the war had ended, AT&T petitioned the FCC to build additional cable facilities between New York and Washington, D.C., because CBS, NBC, and DuMont had consulted with the telephone company concerning the establishment of future television networks. In July of 1945 the commission authorized construction of this new cable, but with the proviso that it be used for experimental, noncommercial television transmission service only. The completed cable was inaugurated with a broadcast of Lincoln Memorial services on 12 February 1946 from Washington, D.C. to NBC, CBS, and DuMont's stations in New York [11, p. 159]. This date is commonly referred to as the birthdate of television network broadcasting, despite the fact that earlier experimental interconnection had taken place. Broadcasts over the cable multiplied rapidly, but only by the three companies mentioned previously. In July of 1947 AT&T requested FCC authorization to begin commercial operation of its television cable facilities. Such authorization was granted on 12 February 1948,

and commercial television networks became a reality [11, p. 162].

THE NASCENT TELEVISION NETWORKS

During all or part of 1947, 15 television stations were in operation and 54 more permits to construct new stations had been granted [7, p. 3]. At least seven companies were contemplating the establishment of television networks. They included the four national radio networks: NBC, CBS, ABC, and Mutual; two manufacturers of radio television equipment, DuMont and Philco; and one motion picture company, Paramount. The fact that these companies were trying to form networks was never construed by the FCC as running counter to its hope for "genuine and healthy" competition in television broadcasting. Accepting advertiser-support as a fait accompli in the American system of broadcasting, the commission pointed out [11, p. 150],

> ...that the high cost of program production for television, in order to be economically feasible, must be spread over a large number of stations and communities through interconnection. ...[and] that networks of generally the same type as had grown up in radio would be relied upon to assume the responsibilities for national interconnected service. ...[but since] radio experience had taught that a national system of broadcast communication, based upon advertising support and operated through interconnection, is centripetal in tendency. ...the Commission plac[es] prime importance on avoidance of dominance at the national level.

Thus the competition envisioned by the FCC seems always to have been that between a relatively small number, for example, six or seven, of networks, but with no one or two of them clearly stronger than the rest. Given the normalizing of the postwar economy, and the commission's relatively "final" decision regarding the UHF and color television questions, it should come as no surprise that in 1948 a rush to stake out national television networks began. However, as the rush began the field of entries quickly diminished. The Mutual Radio Network, due to lack of financial resources, dropped its television network plans early in 1948. For similar reasons, one manufacturer, Philco, also dropped out at about the same time. Paramount Pictures, although not officially dropping its network plans, did little more than operate two stations. By the middle of 1948 it had become obvious that the "genuine and healthy" competition which the FCC had hoped for in television would at best be limited to four national networks: CBS, NBC, ABC, and DuMont. While fewer than the number originally envisioned by the commission, there was still hope (at least in the FCC's opinion) that the

industry would be "competitive" if no one or two of these networks were to dominate the industry. To prevent this from happening, the commission had, from the start of commercial operations, limited the number of stations allowable to any one owner to five. However, with such a rule in effect, the route to power in the industry merely was shifted to the affiliation process.

NETWORK AFFILIATION

Broadcasting stations' affiliation with national networks came about first in radio due to the advertiser-support nature of the medium. Affiliation is a series of contracts by which a network company secures access to the frequencies of a number of geographically dispersed stations on which to show its programming. The network company then sells to advertisers time spots in which these advertisers can show commercial messages over the entire network of affiliated stations.

Affiliation works to the benefit of both stations and networks. The network usually receives about 70 percent of the proceeds of time sales to advertisers. Every new affiliate increases the size of its potential audience, thus raising the price it can charge advertisers per time period of its programming. The local stations involved, while only receiving about 30 percent of the time sale proceeds, nevertheless are relieved of the financial burden of supplying programming, and the task of finding sponsors, for those time periods when it "clears," that is, accepts for broadcast, network program offerings [15, pp. 20-21]. Local stations also sell "spot" announcement time before and after programs, and this time usually is worth more to advertisers if it is adjacent to a network, rather than to a locally originated, program [1, p. 261]. Affiliation, even in the early years of television, was financially attractive to most stations. The only question to be answered was, with which network to affiliate?

By the end of 1948 there were 50 stations on the air and permits had been granted, or applications filed, for over 100 more stations. Of the on-the-air stations, 28 were affiliated with CBS, 24 with NBC, 20 with ABC, and 14 with DuMont [11, pp. 166-82]. If we add up these affiliate totals we get more stations than were on the air, but this oddity is explained by the fact that except for the stations owned and operated by the networks themselves, very few others affiliated exclusively with any one network. Thus they had the added advantage of a selection of network offerings from which to choose one to "clear" in any given time period. Although comparative clearance figures are not available, the fact that many of the 50 stations on the air were owned by persons or firms that also owned radio stations that were exclusively affiliated with CBS or NBC probably tended to make clearances of CBS and NBC programs more frequent than those of ABC or DuMont.

THE TELEVISION "FREEZE"

The viewing public, responding to increased viewing opportunities, started buying more and more television sets. Factory production for 1948 was over 1 million sets, more than five times the number that had been produced in 1947 [9, p. 28]. Furthermore, during 1948 cable interconnection had been extended from the Eastern seaboard to Pittsburgh, Cleveland, Buffalo, Toledo, Detroit, Chicago, Milwaukee, and St. Louis [11, p. 62]. With expanding network interconnection, national advertisers began experimenting with the new medium and further requests for station licenses were generated. By the fall of 1948, however, the FCC realized that the VHF spectrum would soon prove inadequate for the expanding television industry. This fact combined with increasing interference between channels already on the air and new calls for a reconsideration of the "color" question led the commission to call a meeting with industry representatives at which it announced its intention to reconsider station allocations and technical standards. Pending the outcome of this reconsideration the commission, by its order of 30 September 1948 (since known as the "freeze" order), called a halt in the processing of applications for new television stations [13, p. 22].

Hearings concerning station interference and to determine the feasibility of commercial operations in the UHF band were held late in 1948. After a variety of testimony from industry and government sources, in July 1949 the commission set out new proposed technical standards and a nationwide station assignment plan, inviting industry comments on both [13, p. 24].

These comments were swift in coming and generally critical in nature. The most controversial part of the FCC's proposed decision was the plan to intermix VHF and UHF station allocations in the same markets. The commission felt this was necessary in order that every community in the country be within the signal range of at least one station. This principle of "complete local coverage," although sounding rather democratic and perhaps even procompetitive to those unfamiliar with the economics of commercial television broadcasting, was realized to be totally unsound by the industry itself [14, pp. 98-100]. The problem with the commission's plan stemmed from the advertiser-support nature of commercial broadcasting. It is the number of potential customers (viewers) which their commercial messages might reach which determines whether advertisers will buy time from any given station or network, and how much they will be willing to pay for this time. Given the facts that in 1949 virtually no television sets were equipped to receive UHF signals, and that UHF transmitters developed lower-power (and therefore shorter distance) signals than their VHF counterparts, the potential audience of UHF stations would be extremely small. This would put these stations at a decided disadvantage vis-à-vis VHF stations in competing for advertisers in the same markets. Thus

many critics maintained that the UHF allocations in the FCC's plan were merely "phantom" stations, with little or no chance of being applied for, or if getting on the air, with little chance of ever being profitable. Furthermore, by spreading the available station allocations thinly over the entire geographical area of the country, very few large metropolitan areas could have as many as four VHF stations. The result of this would be that not all four of the existing television networks could obtain the station outlets in major markets which were needed in order to survive. This was crucial because advertisers who bought network programming time, like those who bought local station programming time, were also concerned with the number of potential consumers their commercial messages would reach. Without affiliates in all major markets, the programs of ABC and DuMont (who were already behind in numbers of affiliates) would have much smaller circulations than those of CBS and NBC. Thus it seemed unlikely that under the FCC's proposed plan, the two weaker networks would be able to compete effectively for advertising revenues.

In response to the FCC's seemingly short-sighted proposal, the DuMont network (which did not have radio stations as did ABC, and thus stood to lose its place in broadcasting altogether) submitted its own nationwide station allocation plan about a month after the commission's had been unveiled. The DuMont plan yielded a minimum of four channels, either UHF or VHF, not intermixed, in most of the major metropolitan markets. There was but one intermixed city among the first 325 in market rank in the DuMont plan [14, pp. 98-99].

The principle of nonintermixture can not be emphasized enough, for had the FCC adopted it, manufacturers would have had an incentive to produce television sets with the capability of receiving UHF signals for sale in those cities with such allocations exclusively. In contrast, with intermixed markets, those same manufacturers, who were doing quite well making VHF-only sets, were unwilling to invest time and money developing UHF sets until they saw that the UHF stations would get on the air and survive against their VHF competitors. Of course they could not hope to get on the air and survive if no sets were equipped to receive UHF signals, and so it became a vicious circle with seemingly little hope of being broken.[7]

The FCC, however, reacted coldly to DuMont's proposed plan. It is unlikely that it was trying to lessen competition or to destroy the two smaller networks (which would have been antithetical to its previously stated industry goals), but rather it once again was unwilling to affect adversely existing interests in the industry, and had chosen to compromise instead. In this light the seemingly irrational allocation plan was actually the result of a completely rational (at least from the FCC's viewpoint) decision not to disturb existing VHF stations. In contrast, DuMont as a potential competitor, not a sensitive regulator, had proposed

changing 20 on-the-air VHF stations to UHF and changing 29 other VHF assignments (as planned by the FCC) to UHF in order to achieve almost complete nonintermixture [14, p. 99]. The commission had set September of 1949 as a target date for deciding on the final shape of the station allocation plan, but postponed its decision indefinitely when the "color" controversy erupted again.

At least three companies, including CBS and RCA, had claimed in the fall of 1949 to have perfected color television systems. As a result, members of the Senate's Interstate and Foreign Commerce Committee, particularly its chairman, Edwin C. Johnson of Colorado, expressed the view that "if color were here, this was a crucial fact and every effort must be made to foster its acceptance" [13, p. 24]. The commission, in large part bowing to the committee's pressure, postponed its allocation hearings and began instead color television hearings. When started it was thought they might last about three weeks. Instead they lasted a year and provoked bitter controversy [13, p. 25].

As the color television hearings proceeded into early 1950, pressures were mounting to end the "freeze" which was still in effect. Areas of the country withouth television were clamoring for the new medium. Congressmen from "blacked-out" areas questioned why the allocations problem could not be settled separately from the color television controversy, or at least temporary stations be allocated to those areas with none at all. Prominent television critics such as Jack Gould of the *New York Times* accused the FCC of being "at the beck and call" of Senator Johnson who wanted the "color" question settled before all else [4, p. 253]. ABC and DuMont argued that unless new allocations were made soon, allowing them to obtain more affiliates, their networks would go under. A frustrated Allen B. DuMont, president of his network, charged melodramatically in February of 1950 that there were "men whose refusal to face reality has mired television in a rainbow-hued swamp that can soon have our industry on its knees."[8]

Finally in the fall of 1950 the FCC ended its color television hearings with a decision to adopt the CBS system of color equipment.[9] Returning its attention to allocations, the commission issued its *Third Notice* concerning station assignments on 21 March 1951 [13, p. 26]. To the dismay of the industry, its new proposal was not substantially different from its 1949 plan. It included both objectionable parts of the earlier plan -- intermixture and complete local coverage. Again the FCC invited industry comment, and a now desperate DuMont submitted an alternative plan which emphasized nonintermixture and assigned four or five VHF channels to as many major markets as possible.

But the commission was no more receptive to this DuMont effort than to the previous one, and on 11 April 1952 issued what became its "master plan" for television allocation, the *Sixth Report and Order* [13, p. 26]. The station assignment table was basically the same as had been laid out in the *Third Notice*, and while

DuMont's objections to the plan were noted, the commission nevertheless felt [14, p. 100],

> A basic objective of the DuMont assignment plan is to provide major metropolitan centers with multiple V.H.F. stations. In particular, DuMont seeks the assignment of four V.H.F. channels to such communities - an objective related to DuMont's contention that this is necessary to promote network competition.....the commission has taken into account other significant factors. It finds that the principles of assignment which DuMont advocates are inadequate in that these principles do not recognize specifically the need to provide an equitable apportionment of channels among the separate states and communities and...therefore the Commission...has attempted to provide at least some V.H.F. channels to each of the states although in some cases this was done where an assignment might otherwise have been made to a large metropolitan center in an adjacent state.

This reasoning, which seems to have been politically motivated (to avoid criticism by members of Congress from less populous states), rather than economically justified, led a noted television engineer, Stuart L. Bailey, to comment that the FCC had given "square miles priority over people in the assignment of channels.[10]

THE "FREEZE" ENDS

With the issuance of its *Sixth Report and Order*, the commission lifted the "freeze" on new station allocations effective 1 July 1952. However, there was a backlog of applications to be processed, and some materials shortages caused by the Korean War; thus, only 14 stations in addition to those operating or authorized before the "freeze" started got on the air in 1952 [13, pp. 30-31]. As to the results of the almost four years of caution on the part of the FCC, there is no doubt that this time period shaped the future structure of the television broadcasting industry. Since so many of the prefreeze stations had affiliated with CBS or NBC, the "freeze" on new allocations meant that these two networks had the field all to themselves in all but 12 of the 63 market areas that had television service [16, p. 1018]. Although comparative clearance figures are not available in those markets where all four networks operated, the breakdown of advertisers' expenditures set out in the table seems to bear out the notion that CBS and NBC built up a clear position of dominance in the industry during the "freeze." Advertisers' expenditures are usually directed to those stations or networks with the largest circulations, and without adequate numbers of affiliates to clear one's programs a network cannot make much claim to a large national circulation. The fact that CBS and NBC's billings were from two to four times greater

TELEVISION NETWORK BILLINGS[a] 1949-52
($ millions)

	Total network billings	NBC	Percent of total[b]	CBS	Percent of total	ABC	Percent of total	DuMont	Percent of total
1949	$ 12.3	$ 6.5	53	$ 3.4	28	$ 1.4	11	$ 1.0	8
1950	45.3	21.2	47	13.0	29	6.6	15	4.5	10
1951	128.0	59.2	46	42.5	33	18.6	15	7.8	6
1952	180.8	83.2	46	69.1	38	18.4	10	10.1	6

Source: Publishers' Information Bureau Estimates appearing in *Television Factbook*, Number 23, (Fall-Winter 1956), p. 26.

[a]Network billings, which are not exact revenue figures due to discounts, and so on, are nevertheless accepted by the networks themselves and by the industry generally as a satisfactory index of comparison and trends.

[b]Individual network's billings may not add up to the industry total nor their percentages of the total to 100 due to rounding.

than either ABC or DuMont's in this period points up the dismal revenue picture of the latter two networks.

In addition, ABC and DuMont faced problems on the cost side of the picture as well. During the "freeze" AT&T had completed a transcontinental link of coaxial cables and had filled in much of the rest of the nation as well. The rates it charged the networks for the use of this interconnection service came under two plans -- contract and occasional use. The contract rate was $39.50 per month per mile for eight consecutive hours of audio and video relay per day, for seven days a week. This was in contrast to the occasional rate which was $1.15 per hour per mile per day. Thus if an occasional user such as ABC or DuMont which only cleared a couple of hours of programming per day with *all* their potential affiliates bought two hours per day for a month, the monthly charge would amount to $69.00 per month per mile [13, pp. 543-44]. ABC and DuMont protested to the FCC that the rate structure was discriminatory and a violation of the antitrust laws, but the commission took no action [13, pp. 544-46]. Adding insult to injury for DuMont was the fact that it was required by AT&T to purchase the same extra audio facilities as did CBS, NBC, and ABC for their radio networks, despite the fact that DuMont had no such network. Again a protest to the FCC in this matter went unheeded [13, p. 546].

These financial handicaps were to continue to plague ABC and DuMont in the ensuing years. ABC received a large influx of capital as a result of a 1953 merger with United Paramount Theatres, but even then continued to struggle. It was not until 1955, when the DuMont network ceased national operations, that ABC (after picking up many of the fallen DuMont's affiliates) was able finally to begin a rise toward parity with CBS and NBC in the television broadcasting industry.

CONCLUSIONS

The early years of television network development were plagued by technical and regulatory problems. The FCC's attempt to come to grips with complex technological problems and its continuing policy of caution and delay played a dominant role in determining the industry's future structure. The end result of the interaction of technological and regulatory constraints on the industry was to produce just the situation the FCC had avowedly wished to avoid -- the early dominance of television broadcasting by the very same two firms which had earlier come to dominate radio.

NOTES

1. Many of these early experiments are related in [6].
2. From FCC Release No. 34168, 22 May 1939, quoted in [11, p. 142].
3. From FCC Release No. 41662, 29 February 1940, quoted in [11, p. 151].
4. The role which these engineers played in the formulation of the industry's technical standards in the 1940s, as well as a second NTSC's role as a critic of technical standards adopted by the FCC in the 1950s is related in [2].
5. In 1947 the FCC, in order to provide more spectrum space for land-mobile and other communication services, reduced to 12 television broadcasting's allocation of VHF channels.
6. These were later supplemented by microwave relay facilities.
7. A law was passed in 1962 which required all TV sets manufactured in, or imported into, the United States to be equipped with UHF reception capability.
8. Quoted in [8, pp. 1-2].
9. This decision became a dead letter since the Korean War intervened, and when materials needed to produce color apparatus were again available technological advances had made the CBS syster obsolete.
10. Quoted in [4, p. 244].

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