

IMPLICATIONS OF THE DEVELOPING OPERATING ENVIRONMENT ON CATV TERMINAL EQUIPMENT

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ABSTRACT

Terminal equipment options are analyzed with respect to marketing and operating environment factors. Based on this analysis, a business model is proposed and developed in two scenarios for further terminal equipment development.

INTRODUCTION

Over the past two years, we have seen a major refocusing of effort in our industry. As franchising has wound down, we have seen the emphasis change from high technology blue-sky services to basic operating principles. This is best seen in the evolution of this convention over the past five years. Today, the watchword is: How do we run our day-to-day business smarter and more efficiently. During this same period, our industry has been overwhelmed by spiraling technological development. We have gone from 270 Mhz one-way plant to 550 Mhz two-way plant. With all of this excitement concerning our new technological abilities, it has been easy to lose sight of our reason for being in business. You have perhaps seen signs of it in your own company. In discussions with cable television engineers around the industry, I have been informed that we must build fiber optic switched star networks because the telephone company is doing so. Or that 1,000 Mhz is feasible and just around the corner in order to provide us additional channels. Between our historical infatuation with technology and the current emphasis on efficiency, it is critical that we keep focused on our business - the delivery of entertainment and information to consumers.

In answer to the question "what product does a cable system sell," one of two perspectives can be taken. Historically, we have been in the business of selling clear pictures and different program viewing opportunities to our customers. More recently, an alternative answer based on the broadcasting model might be appropriate: we are in the business of selling our viewers' time and attention to advertisers. Nowhere does it say we are selling technology. The technology is simply a means to an end. It can certainly enhance the viewing experience for our customer by providing full-color stereo-sound entertainment. Or it can increase our customers' convenience by providing full function remote control or time shifting through a video cassette recorder. But this technology is not an end to itself.

In the following sections, I will outline several environmental considerations which impact our business today, the technical tools we have to address these concerns and the effectiveness of our current approaches. Based on this analysis, I will suggest a business model to guide our future strategy. Two terminal equipment configurations are analyzed with respect to the model. This exercise is based on the belief that our industry has reached a level of maturity which now requires us to take a long range view of our ultimate destination. Our current practice of discarding our plant and completely rebuilding every 15 years cannot continue.

ENVIRONMENTAL FACTORS

There are three forces in our environment which must be considered in building a foundation for future developments. These are: the operating business parameters of a cable system, our customers, and the entertainment marketplace in which we and our customers meet.

Historically, the cable television business has been a capital intensive one. Despite dramatic decreases in the general cost of electronics, our capital investment per subscriber has increased due to two reasons: our desire to provide more services yielding greater revenue and the franchising authority's desire to get the ultimate, state-of-the-art communications system built. While the total demand for capital is decreasing as our new build period concludes, there is a continuing requirement as we rebuild our older, more mature systems. A portion of this expenditure is justified as we add the capacity necessary to introduce profitable services, but a portion is driven by the desire of each community to have at least the bells and whistles of its neighbors. Within the "utility" business, we are probably unique in this regard. When was the last time your local telephone company rebuilt its plant and increased services in order to get its franchise renewed?

As we have gone from delivering a few off-air signals to importing distant signals to providing unique satellite-delivered services and premium movie services, we have continually increased the value of our product. Today, the entertainment value we provide to our customer is so great that we have created a parallel shadow industry in the selling of "black boxes." Obviously, this has a negative effect on our

ability to achieve a fair return on our capital investment. While we have demonstrated that smart management and legal protection can contain theft of services to manageable levels, the need for a more secure delivery technology continues. Our practice of changing converters periodically to increase our signal security just aggravates our capital requirements.

While the industry has been evolving, so has the consumer. Today, convenience is foremost in the mind of the consumer, what some have called the "7-11 mentality." Their battle cry is: "I want what I want when I want it." This attitude has been mirrored by the growth of the service sector. The consumer electronic industry has been one of the most successful respondents to this attitude. Success in the consumer electronics marketplace is no longer based upon functionality. Rather, it is based upon responding to diverse individual requirements by providing a wide selection of features and benefits. For example, one manufacturer of audio cassette decks has 14 current models in its lineup ranging in price from \$87 to over \$500. The increase in quality from the bottom of the line to the top of the line, i.e., frequency response of the recorded signal, is marginal. The variety of features and packaging options is great: one transport or two to allow high speed dubbing, with or without automatic reverse, with a mechanical or electronic revolution counter, with rotary or linear volume controls, etc. Similarly, a few years back Sony had a hit product in the Walkman. Today, there are at least eight different models from that one manufacturer for what is a very simple product. These models range in price from \$40 to \$400, and again the difference is not function or quality but rather features. Probably the ultimate example is the compact disk (CD) player which has been such a success this year. By employing digital recording techniques, these devices produce no measurable difference in the audio quality from the bottom of the line to the top of the line. Yet, there is a sufficient range in features to warrant a price range from \$250 to \$1,500. Again, this price difference is justified on the basis of ancillary features, e.g., sequential playback or random access, remote control, portability, etc.

In reviewing spending patterns for consumer electronic products, it is difficult to say whether this diversity is cause or effect. The fact is that over the last five years, consumers have spent an increasing percentage of their disposable income on consumer electronics, increasing from \$66.60 per capita in 1980 to an estimated \$103.80 in 1985, adjusted for inflation. (See Table 1) The message here is that our marketplace can be expanded by responding to the consumers' desire for diversity and convenience.

At the same time our industry and consumers have been changing, we have entered into a new and different marketplace as well. Historically, cable television was a product introduced in the

suburban and fringe area except for New York City and San Francisco. Today, we have moved into the middle of the urban marketplace. What we have found there is that the demographics are much more diverse, varying from the stability of home owners to the transience of renters. We are also operating in an environment where there is increased competition for the entertainment dollar. The options available to the urban consumer range from live theater to video cassette rental with many more in between. While the overall demand for entertainment continues to increase somewhat, the consumer has a much greater opportunity to become increasingly selective. She will pick those options which are found to be most desirable to that individual. Satisfying this consumer requires a range of solutions.

CURRENT TERMINAL EQUIPMENT OPTIONS

As the value of our product has increased and the consumer electronics industry has adapted to the cable environment through cable-ready television sets, an important function of our consumer interface has become that of protecting our product. The two principle devices for performing this are converter/decoders and traps. The converter/decoder has provided a reasonable solution to extending the tuning range of the customer's receiving equipment while at the same time providing for signal security through the selective descrambling of the signal. However, there are specific shortcomings.

- o Capital intensity: Use of converters currently requires placement of up to \$200 of our equipment in the customer's home. In this environment, our investment is subject to theft, tampering and damage, an added cost of doing business.
- o Customer convenience and selection: With converters, we are still in the era of the "black dial telephone." The only option we typically offer the customer is a remote control, generally not full function and at an extra charge, even if the customer already has the remote control feature on his television set. We don't even offer an option as simple as color coordinating the converter with the

Table 1
Consumer Electronic Expenditures
(all amounts in 1985 dollars)

<u>YEAR</u>	<u>PER CAPITA EXPENDITURE</u>	<u>% OF DISPOSABLE INCOME</u>
1980	\$ 66.60	.6%
1981	\$ 65.20	.59%
1982	\$ 80.40	.74%
1983	\$ 96.10	.88%
1984 (est)	\$100.00	.89%
1985 (est)	\$103.80	.89%

Source: Link Resources

customer's furnishings. And as becomes more apparent daily, our devices are incompatible or awkward in the developing consumer entertainment environment. The confusion and misunderstanding generated by cable-ready television sets and VCRs has just begun.

- o Enhanced services: Our equipment currently depends upon the signal format being delivered, leaving us vulnerable to changes in television technology. Thus, the development of Multichannel Television Sound or High Definition TV can have serious capital investment implications for an operator. Our systems do not provide transparent pipelines. Thus, the introduction of enhanced services will generally require either incremental investment, aggravating our capital intensity or the denial of the services to the customer and the revenue to us.
- o On-premise vs. off-premise equipment: With the diversity of demographics present in the urban market, it is to our advantage to have a range of solutions which include both on-premise equipment for the up-scale market where flexibility is important and off-premise equipment for the transient market where asset protection is important. However, general product incompatibility limits our ability to tailor the solution to our needs.

The principle alternative to converter/decoders for signal security is trapping. With the development of the multi-pay service environment, traps have become impractical. Their lack of flexibility, imperfect security, number of combinations to be stocked and degradation due to stacking have limited their applicability, especially in the modern urban system. On the other hand, because traps are passive rather than active devices, they provide the greatest degree of compatibility with the developing home entertainment environment by allowing us to let the customer select and invest in the consumer viewing equipment desired. Thus the home entertainment environment can be directly tailored to the customer's desires and means.

More generally, our technology has developed as a series of small incremental steps in response to short-term goals. We have developed from no interface equipment using the existing television tuner for delivery of off-air channels to an extended tuning range using the mid-band and providing a converter for those signals. Security was achieved because television sets could not tune the mid-band. Further developments extended the tuning range, introduced scrambling, two-way communications and impulse pay per view. However, with all this development, or perhaps because of it, there is little compatibility from one system to another. It is evident that our technology has

developed without a long-term rationale to guide short-term decisions.

As a result, we have developed a closed network. Each small step has removed a degree of freedom. We have confused our customer with the variety and complexity of interconnections of our interface equipment. We have introduced incompatibilities between our systems, locking us into single-source purchasing and creating inefficiencies in our inventories. At the same time, our manufacturers have limited their markets. In short, we have let our technology get in the way of our customer's enjoyment and our success. My basic premise is that this situation arises, in large part, from one mistake: **the wrong person is making the purchase decisions.** The motivation of a cable system chief engineer is radically different from that of his customer. The engineer is motivated to minimize capital expenditures and maximize the life of each converter/decoder or trap. The consumer, on the other hand, is motivated to buy those products which appeal to his fancy. The power of this distinction is illustrated by the difference in converter and television set sales, shown in Table 2.

Table 2
Television Set versus Converter Sales
(all units in millions)

YEAR	INCREASE IN TV HOUSEHOLDS	TV SET UNIT SALES	INCREASE IN BASIC CABLE SUBSCRIBERS	CONVERTER SALE
83	.8	19.8	4.3	8.3
84 (est)	.8	21.2	4.6	8.4
85 (est)	.8	20.9	4.8	7.1

Source: U.S. Bureau of the Census, EIA, Paul Kagan

In other words, while television set sales have outpaced marketplace growth by 25 to 1, converter sales are less than double marketplace growth.

BUSINESS MODEL

This analysis demonstrates two points that are critical to the continued success of our industry. First, responding to the consumers' desire for diversity and convenience expands but also fragments the marketplace. Second, although it seems contradictory, this expansion can take place only where there are stable, well understood, **standard interfaces.** For all the diversity in audio cassette decks, there is one standard for tape size and speed, input signal levels, etc. Diversity of features could not have developed in the absence of these basic functional standards. Even in video cassette decks where there are currently two competing standards, each standard is stable and has spawned a family of functionally compatible but feature-diverse products.

These factors are easily accommodated by a model which divides our business into two

complementary sectors: a utility sector and a consumer sector. The business of the utility sector is to provide a high-quality, simple, transparent transport service. The utility sector is capital intensive, based on our investment, with operating efficiency as the key success factor. Important aspects include:

- o protecting capital investment by limiting customer premise equipment owned by the operator,
- o controlling bad debt through approaches such as addressability,
- o limiting service calls through status monitoring, addressability and better training.

The logical terminating point for the utility sector's responsibility is at the ground block.

In contrast the business of the consumer sector is providing the customer with the product desired delivered with the options and benefits desired. The product is video entertainment and information software packaged to provide the desired content in a manner which balances cost with perceived value. The convenience, features and benefits come from the viewing equipment chosen. The key success factors are selection and price/value. This sector fits directly into the consumer electronics marketplace - provide a wide range of features and let the consumer choose, and pay for, those desired. Match what is received with its perceived value. Thus, the consumer has options which range from black and white normal definition television to full-color high-definition television. Likewise, the options for audio might range from a three-inch low fidelity speaker to full stereo compact disk quality digital sound. The choice of how the signal is viewed and the incremental investment necessary to receive these options are the customer's. Under this model, the operator's investment is in the utility plant, i.e., the stable, transparent, protected transport medium. The consumer sector which is more volatile is not capital intense - the consumer has made the investment. The operator can now make a rational business decision whether to participate in the sale and rental of the home equipment.

The viability of this model is based on observation of 30 years of development in the telephone industry. Thirty years ago, the telephone company was in the business of selling dial tone. They provided a black dial telephone, and the concept of consumer choice didn't enter into their business. The local network was closed - the telephone company owned everything from one end of the network to the other. Development was stagnant, and there were limited opportunities for additional services.

A combination of regulatory and competitive pressures have forced the development of this over the past 30 years into a dynamic industry in which everyone will ultimately benefit. Today,

we see the regulated companies operating in the utility mode. They sell dial tone, the provision of a transparent transport medium. In parallel, we have seen the blossoming of a new consumer electronics business in which there has been a proliferation of manufacturers, of equipment options available and of new services offered to the consumer. The magnitude of this developing marketplace and the benefit of allowing the end user to make the purchasing decision can be seen in Table 3.

Table 3
Telephone Sales

<u>YEAR</u>	<u>SALES</u> (Thousand Units)	<u>AVERAGE PRICING</u> ($\$$)
1982	5,700	70
1983	19,700	47
1984 (est)	30,300	41
1985 (est)	34,200	40

Source: EIA

Despite the rhetoric, this appears to be a win-win situation. The consumer today has a range of choices not just in the color of instrument but in the features which it provides and ultimately in the carrier providing the service. While we are seeing some temporary price dislocation as subsidies lapse and prices become cost based, ultimately competition will drive the unit costs of communications down.

At the same time, the manufacturers have benefitted. There are many new manufacturers in business, and the range of products offered today has generated an increased demand on the part of the consumers. The regulated companies have also benefitted because per capita usage has increased. If you make the service easier to use by providing features which speak to the consumer's individual needs and desires, they will pay you back by increasing their usage. And, despite all the dire predictions to the contrary, the telephone network has not fallen apart.

FUTURE TECHNICAL DIRECTIONS

There are two requirements which must be met in order to implement this model. The first of these is stability, the assurance that our long-term ability to receive a fair return on our capital investment depends on the wisdom of our business decisions and not on political whimsy. The recently enacted cable communications bill provides us the stability necessary to operate a utility-type business by providing the presumption of franchise renewal.

The second requirement is the standardization of the interface between our network and consumer reception equipment. This is the more difficult one to meet for several reasons. First, it runs counter to the entrepreneurial heritage of our industry. In this business, everyone is an inventor, most in exactly the area which requires standardization, the interface to

the customer. Second, there is the fear of legal restriction. In an industry where the largest operator controls less than 10% of the marketplace, there is no de facto standard setter as there was in the telephone industry. The necessary cooperation to achieve such standards would require an interaction between operators and manufacturers that might be subject to scrutiny under antitrust laws. Third, any standardization would require the active cooperation of our manufacturers and they have a valid concern with an increase of foreign competition made possible by standardization. Would the development of an interface standard and corresponding open network have the same impact on the manufacturers of cable television equipment that it has had on the manufacturers of consumer electronic equipment? Fourth, and foremost, there is no short-term pressure to achieve such standardization. The benefits which standardization provides are all long-term.

It is interesting to note that, even in the "black dial telephone" days, there was a high degree of standardization in the telephone industry. This is due in large part to the dominance of a single operator but also was due to the need to interconnect telephone systems as a natural extension of the services provided.

Two potential scenarios for future systems development meeting the conditions of the business model suggest themselves. These are only two out of many potential scenarios and are not necessarily the most likely. While it is important to evaluate many such scenarios, the ultimate implementation would depend upon general agreement on one standard.

Scenario 1. Security the consumer can own. A natural extension of the current trend in set top converters would be a form of signal scrambling sufficiently secure that operators would feel comfortable with the consumer owning the descrambler. Minimum requirements for such advice would include:

- o Addressability with a nationwide addressing scheme to provide for free movement from system to system,
- o Mechanical and electrical security sufficient to prevent successful tampering with the device,
- o A parameterized scrambling algorithm with many potential variants,
- o Use of a key required for descrambling,
- o Use of standard techniques for secure encrypted delivery of these keys.

Several products are now coming on the market which have some or all of these characteristics. Typically, they provide for soft video scrambling with hard (digitally encrypted) audio scrambling. This combination is adequate to discourage the manufacture of pirate boxes,

assuming that the encryption methodology is secure.

Customer-owned, secure converters fit the requirements outlined above by placing the purchasing decision where it belongs, with the consumer. With the standardization of such a scrambling methodology, it would be feasible to include the descramblers and addressable receivers in all appropriate consumer electronic devices. Thus, the issue of consumer convenience is adequately addressed. The implementation of such an approach requires overcoming the standardization hurdles mentioned above. Specifically, in addition to standardizing on NTSC signals and F fittings, it would be necessary to standardize the scrambling algorithm, key distribution method and the addressable data transmission protocol. It would also be necessary to establish distribution channels for these products. The logistics of introduction must also be examined but are no more difficult than the situation today when we change converter types in a system.

The benefits to all industry participants are evident:

- o Increased consumer satisfaction through increased selection, convenience and lack of duplication,
- o Reduced capital investment on the part of cable operators,
- o Reduced risk for cable operators in the event of the introduction of new signal types since the interface equipment would be purchased by the consumer. Note that the security can depend upon the signal format since, in the event of a new signal format being developed requiring new security, the consumer has to purchase new viewing equipment anyway. The operator's investment is protected.
- o Increased demand for manufacturer's product by expanding from an engineering-driven to a consumer-driven marketplace.

Scenario 2. Cost effective, non interfering security. An alternative approach is the separation of security from the consumer interface equipment. Minimum requirements for such a device would be:

- o An addressable tap or trap,
- o The method of obtaining security would not be dependent upon the signal format thus providing compatibility with future signal types,
- o Independent control of each 6 Mhz section of spectrum, finer resolution would be desirable,

- o A capital cost of approximately \$20 per port.

While this attacks the problem from a different angle, it also fits the characteristics outlined above. The capital investment of \$20 per port is manageable, and the transparency provides for consumer convenience. In this case, there is no customer interface decision to be made in the home. Rather, current cable-ready television receivers and other consumer electronic products would work. Further, the ability to control bandwidth without being sensitive to signal format provides a transparency necessary for the introduction of future ancillary services.

Again, the benefit to industry participants is evident:

- o Transparency to the consumer and therefore convenience of not having to worry about yet another set of control devices,
- o Limited risk of obsolescence to the operator because of the ability to control bandwidth in a signal transparent fashion,
- o A new market for manufacturers in providing such a device.

In this scenario, the burden of standardization is less severe, basically F fittings, signal levels, frequency assignments and channel numbering plans. However, the technical hurdles to overcome are much greater.

CONCLUSION

As our industry matures, reaching the end of its new build phase, we have achieved a significant level of penetration and offer a consumer electronic marketplace to be reckoned with. However, we still suffer from considerable technological fragmentation. I have suggested a long-term view which separates the utility and consumer sectors of our business. I believe that all participants benefit from an evolution from our current closed network to an open network in which we as operators provide a transparent pipeline for the delivery of entertainment signals. This pipeline, because of its transparency, provides the long-term stability needed to achieve a reasonable return on our capital investment. The consumer participates by investing in the appropriate interface equipment, thus allowing for the diversity and feature orientation that should rightfully be an individual choice for each person. By putting the purchase decision where the value is perceived, we increase consumer satisfaction at the same time that we reduce our capital commitment.