

A CORPORATE PLANNING MODEL
FOR A NEW BUSINESS VENTURE*

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INTRODUCTION

In recent years much attention has been focused upon the possibility of providing new communications services to the home. The following is a description of a mathematical model which was developed to assist with the planning of new services and the evaluation of their business potential. In particular, the model represents an information dissemination system based upon a new consumer product--a print-out device for the home. As will be seen, the model is sufficiently general so that it can represent a broad class of information dissemination systems.

The mathematical model is a corporate planning model of a complex new business system which consists of a large number of interrelated products, services, and markets. It provides in-depth analysis of the basic assumptions underlying manufacturing, marketing, production, and general business operations. All pertinent phases of operation and their interrelationships are considered (i.e., production, sale, and servicing of information receivers, production and sale of information transmission equipment, preparation and dissemination of information, etc.). Since the model was formulated to assist with the planning and evaluation of a new business, the scope and details of which were not specified, the model was constructed in such a manner that many business alternatives could be approximated. The evaluation of the business potential resulting from the new products and services is considered from the points of view of a large corporation consisting of many profit centers, the individual profit centers, the consumer, the products and the services.

THE INFORMATION DISSEMINATION SYSTEM

The information dissemination system which is structured in the model is illustrated in Figures 1A & 1B. The information receiver (IR) is the "black-box" in the home which receives information transmitted from any one of several information transmitters (IT) or local broadcast stations. At the consumer's request, the information receiver provides the selected textual and pictorial information in the form of hard copy (soft copy, or display only, may be thought of as hard copy having zero consumable cost). Each information transmitter may provide many simultaneous types of information from amongst which the specific

information to be printed may be selected. The content of the information is assumed to change from time to time during the day. The information transmitters operate on a broadcast basis -- that is information cannot be addressed to individual receivers.

The information dissemination system consists of a number of geographic market segments each of which represents an area serviced by a group of information transmitters (the local broadcast stations). The information transmitters within the geographic market segment broadcast specifically prepared information to the IR's. The market for the information receivers is assumed to be primarily the individual household although a secondary market may develop for business and education applications. In general, the IT's may be suitably equipped television broadcast stations, radio stations, and/or CATV stations.

The information to be broadcast by the IT's may be supplied by a publisher (network) or a portion or all may originate at the IT's providing that the appropriate broadcast equipment has been installed. The information (the final printout) in general will be a combination of advertisements and specially prepared messages. The ad-message combinations may originate at the network publisher for dissemination to all owned and affiliated IT's, at the IT's, or they may be created specifically for one or more IT's by the network publisher.

The various business areas of concern are thus information publishing, manufacture of information transmission equipment, manufacture of information receivers, manufacture of major components for the information receivers, manufacture of consumables (the paper cartridge) for the receivers, operation of information transmitters and servicing of information receivers. All of these business areas with their interrelated products and services are evaluated individually as well as from the point of view of a single broad based corporation. All of the business areas are evaluated in a competitive environment.

The corporate flow of products, services, and funds is also illustrated in Figures 1A & 1B. The following organizations are evaluated as individual profit centers as well as from a total corporate point of view:

- * Network Publisher
- * Owned Information Transmitters
- * Affiliate Information Transmitters

* The model was developed for RCA while Mr. Greenberg was employed by RCA.

- * Information Transmission Equipment Manufacturer
- * Information Receiver Manufacturer
- * Consumer Products Distributor
- * Consumable Manufacturer
- * Major Components Manufacturer
- * Service Organization
- * Licensing Organization

In the above, "owned" implies ownership by the network publisher and "affiliate" implies the use of network or publisher information. Whenever meaningful, revenues, expenses, aftertax profit, total assets, cash flow, indebtedness (negative of the cumulative cash flow to date), return on sales, return on assets, etc., are determined for each of the profit centers and from a total corporate point of view. The foregoing are determined for each year (up to ten) that is considered by the model.

NETWORK-INFORMATION TRANSMITTER RELATIONSHIP

The network publisher and its interaction with the owned and affiliate IT's is modeled after TV. The network publisher accepts advertisements from agencies and material from other publishers and prepares material for national distribution via a network of owned and affiliated information transmitters. The flow of funds depends upon the ad-message category. The network may combine prepared messages with advertisements received from ad agencies for national distribution ($m=1$). Payment for type $m=1$ information, if used by the IT, is from the network to the owned and affiliate IT's. Payment is proportional to ad area and information circulation (the number of requests for printout of the information). The network publisher may supply messages to which the IT's can affix (if the appropriate broadcast equipment is available at the IT's) advertisements for local distribution ($m=2$). If local ads are affixed, payment proportional to ad area and information circulation is from the IT's to the network publisher. The third ($m=3$) ad-message category refers to messages prepared at, and ads obtained by, the IT for local distribution by the IT. For this ad-message category there is no flow of funds between the network publisher and the IT's.

Ad-message categories $m=4$ and 5 consider the possibility that completely prepared information may be presented to the network publisher or IT's for distribution. The flow of funds for $m=4$ and 5 is the same as for $m=1$ and 3 respectively. The network publisher or IT receives remuneration proportional to circulation and the number of pages transmitted.

It is assumed that message preparation can be performed by the network publisher, by the owned IT's and the affiliate IT's. Both editorial and composition costs of message preparation are considered. Since message preparation may be a significant cost of the owned and/or affiliate IT's, the model allows for the possibility that the network publisher may prepare messages specifically for one or more of the owned and affiliate IT's.

Owned and affiliate IT message preparation cost may be reduced if the publisher sells the messages to more than one IT. This has the dual effect of reducing expenses of the IT's and increasing revenue of the network publisher. Message preparation cost at the IT's is important since there must be a viable business at the IT level if there is to be a viable business for the whole system. The detailed flow of funds between the network publisher and the IT's is summarized in Figure 2.

BROADCAST AREAS (GEOGRAPHIC MARKET SEGMENTATION)

The markets for the various products and services are considered on a geographic basis and are segmented according to the type of broadcast area (Figure 3). A broadcast area consists of one or more IT's and the families or household units which can receive the transmission. The areas are classified as "owned" areas (i.e. - one of the IT's in the area is owned by the network publisher), affiliate areas (i.e. - one of the IT's in the area is affiliated with the network publisher in the sense that it uses the network ads and messages), and independent areas (i.e. - none of the IT's in the area are owned or affiliated with the network publisher). Broadcast areas of different types are considered separately because of the considerable variation of the characteristics of different areas as well as the effect of area type on flow of funds. Each of the owned areas are considered individually. The affiliate areas are subdivided into two categories (large and small - in the population sense). The large affiliate areas are also considered individually. The small affiliate areas as well as the independent areas are considered by describing the characteristics of several typical or representative areas and thence specifying the number of these areas added to the system as a function of time.

The basic starting point of the model is the specification of the broadcast areas as a function of time. The specification includes the number of IT's in the broadcast area broadcasting the printout information, their transmission equipment complement, the number of households in the viewing area, etc. This information is provided for each of the owned and large affiliate areas. The small affiliate and independent areas are described by specifying the characteristics of the representative areas and the number of the representative areas added to the system each year. When the growth patterns of the different areas and the number of small affiliate and independent areas added per year are specified, the model determines the total transmission equipment market by equipment type.

The geographic segmentation allows the effects of alternate marketing strategies to be evaluated; for example the effects upon the whole business system of intensive vs. selective distribution of messages may be evaluated.

BASIC CONCEPT (IR SALES & INFORMATION CIRCULATION)

The basic concept employed in the computation of information receiver sales and information circulation is illustrated in Figure 4. It is assumed that the IR market will be a function of cost (to the prospective purchaser), level of service, and the trade-off between cost and service. The cost consists of the information receiver purchase price and the annual cost associated with consumables and servicing. Subjective estimates concerning the consumer reaction to one time cost versus annual cost are required in order to estimate the "cost" that the consumer visualizes when he makes his purchase decision. Similarly, the service that the information receiver provides depends upon the types and quantity of available information. Subjective estimates must be made of consumer reaction to different types of information and the effect that quantity of information has upon consumer attitudes. In effect, level of service is established in terms of the effective number of offerings, i.e., "effective" in the sense that some information is more important than other information in influencing consumer attitudes. Estimates are also required as to the effect multi-channel choice has on the purchase decision. This is accomplished by estimating the relative importance of multiple IR's in a geographic market area. The offerings of each affiliate and owned IR are a function of the number of messages available from the network publisher and the equipment mix at the IR. The number of offerings is also a function of message category (different types of messages), time of day or rate category (prime time, non-prime time, etc.) and the ad-message category (m).

In order to functionally relate "cost" and "service" two terms have been defined; "saturation level" and the "probability of consumer purchase". The saturation level is defined as the fraction of the total number of families which will have purchased information receivers after a long period of time with an invariant information structure (type and quantity of messages) and invariant IR related costs. That is each combination of information structure and IR related cost yields a different saturation level. Therefore, as information structure changes (for example, the number of messages offered increases) and/or IR related costs change, the saturation level will change.

The "probability of consumer purchase" is defined as the fraction of those households which will ultimately acquire IR's which will have purchased IR's after any specified period of time. It represents the cumulative purchase probability as a function of time. The cumulative normal distribution is used to approximate the typical "S" shaped growth pattern of consumer purchases. Thus two degrees of freedom (i.e., the mean and standard deviation of the growth curve) are available to the business planner. The probability of consumer purchase, the "S" shaped growth pattern, is assumed to be independent of the saturation level and is relative to whatever saturation level is in

effect. Figure 5 illustrates the growth pattern for black-and-white television receivers compared to the normal approximation.

Subjective estimates pertaining to saturation level and rate of growth to saturation must be made. As mentioned previously the pertinent data concerning rate of growth to saturation may be communicated to the model by specifying the mean and standard deviation of the normal growth pattern in terms of years. The subjective estimates of saturation level in terms of "cost" and "service" are, in effect, communicated to the model by specifying a number of points in a table as indicated in Figure 4. Actually only three sets of values of cost, service, and saturation level are required since a functional relationship of the form illustrated in Figure 6 is assumed.

The determination of "cost" and "service" allow the functional relationships of saturation level and probability of purchase to be entered. The result is the determination of the information receiver market by broadcast area type. IR sales are thence determined by area type and are a function of inventory and actual production of both the corporation under consideration and competition. Actual production of IR's is a function of production capacity and availability of major components. The product interrelationships are illustrated in Figure 7.

The information circulation computation requires subjective estimates pertaining to the consumer reaction to information. Specifically, estimates must be made of the probability of requesting information. These estimates must be made in terms of message category, time of day category, and ad-message combination. This information is then utilized together with the number of information offerings and the previously computed IR sales (cumulative) to determine the information circulation (number of message requests) by broadcast area and information type. This data is pertinent for the determination of revenues and expenses at the information transmitters and the network. The circulation in all cases is constrained by the availability of the consumables which are required for the hard-copy.

INTERRELATIONSHIPS

In order to illustrate the type of interrelationships incorporated into the model, consider the consequences of a change in the level of service provided by the system. In particular consider (Figure 8) the effect of changing the amount of information (the number of messages) prepared and disseminated by the network via the information transmitters to the consumer. It is assumed that consumer demand for information receivers is related to the service offered - i.e., the quantity and type of messages offered. A change in the quantity of information offered to the consumer will cause a change in the IR saturation level which is reflected as a change in the IR annual market. A change in the IR market will cause a

change in the IR sales (limited by facility, production, and inventory constraints). This in turn will effect the component replacement market. The component market, which consists of the replacement and the original equipment (new information receivers) markets, together with facility, production, and inventory constraints, will determine component sales which in turn may act as a constraint to IR sales (that is IR production cannot exceed the number of available components). Information circulation, that is the number of ad-message requests (printouts), is related to the number of IR's which have been sold to date; hence a change in the IR sales will cause a change in information circulation. Information circulation, in turn, will determine the market for consumables. The consumable market, together with facility, production, and inventory constraints, will determine consumable sales. If consumable sales are less than market requirements, information circulation will be penalized.

These interrelationships effect the numerous revenue and expense items as illustrated in Figure 8. Hence, a change in the amount of information offered may change revenues and expenses associated with information preparation (editorial and composition), information receivers, IR servicing, IR components, consumables, and licensing. In short, all parts of the business system may be affected by a change in the level of service. Similar relationships exist between other factors such as number of IT's, unit manufacturing costs, selling prices, market shares, etc.

INPUT DATA & OUTPUT REPORTS

The input data for the model consists of specifying values for approximately 300 variables. A number of the input variables consist of multidimensional arrays. Thus the 300 variables can have a maximum of approximately 15,000 values. The model can provide very useful results with considerably less data. A major portion of the data need be established only once. In order to evaluate "what-if" questions only minor changes need be made.

The planning model for the information dissemination system consists of about 800 equations which have been programmed in FORTRAN for the RCA SPECTRA 70/45. The program requires approximately 200k bytes of high speed core memory and requires a number of major overlays. On the order of 10-15 minutes of computation time is required to perform an evaluation and create a set of reports.

The set of reports consists of up to 46 different documents. Typically these consist of an income projection, a cash flow projection, and balance sheet for each of the profit centers. The financial reports can also be created for the owned and affiliate information transmitters. Reports are also created which present an analysis of the network published ad revenue as well as analysis of the various products. The product analysis covers the information receivers, the consumables, the

major components, the broadcast equipment and the interaction between the information receivers and the major components. The product analysis reports present detailed summaries of cost, prices, market, sales, etc. Figure 9 and 10 illustrate the level of detail of the financial and product analysis reports, respectively.

SUMMARY

A corporate planning model has been developed and used to assist in the planning and evaluation of new information dissemination systems and related products. The model has been programmed and is operational on an RCA 70/45 which takes about 15 minutes to complete a set of financial plans.

The planning model may be used to evaluate the following types of "what-if" questions: What if the amount of information available via the information receiver is increased? What if the market develops faster or slower than expected? Will sales be limited by facility and inventory constraints? What effect will an increase in markup have on sales and on profits? Should competition be encouraged or discouraged? Should a selective or intensive marketing strategy be established and what are its consequences? etc.

The computerized planning model allows a large number of experiments to be performed in the laboratory prior to the establishment of the business. If the experiments indicate that the business will not be successful, little has been lost.

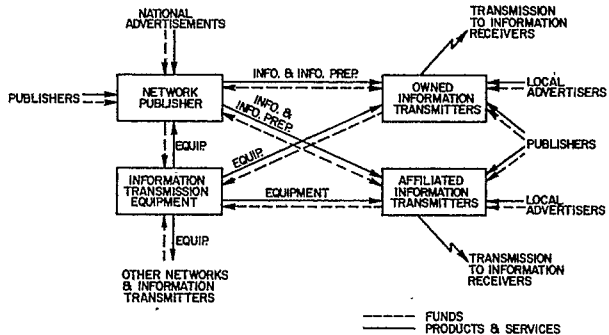


FIGURE 1A. INFORMATION DISSEMINATION SYSTEM FLOW OF PRODUCTS, SERVICES AND FUNDS.

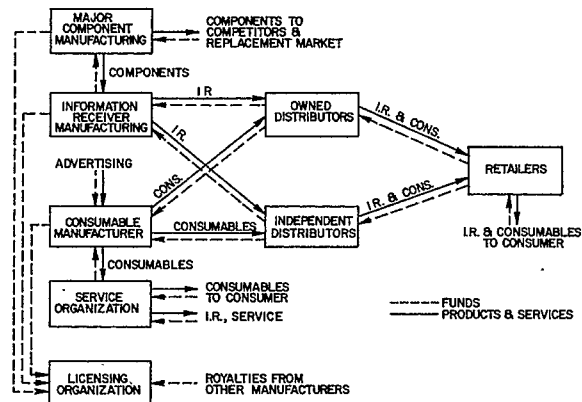


FIGURE 1B. INFORMATION DISSEMINATION SYSTEM FLOW OF PRODUCTS, SERVICES AND FUNDS.

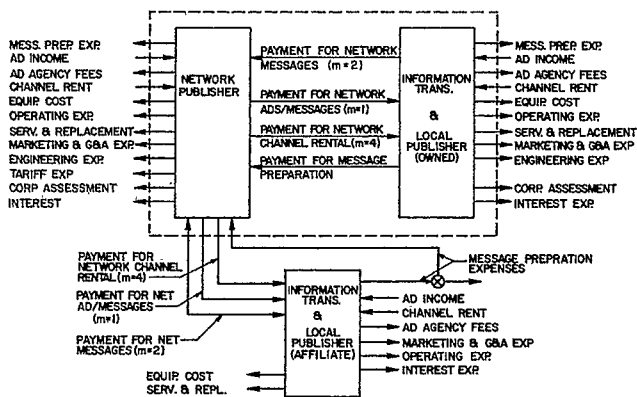


FIGURE 2. NETWORK/IT FLOW OF FUNDS.

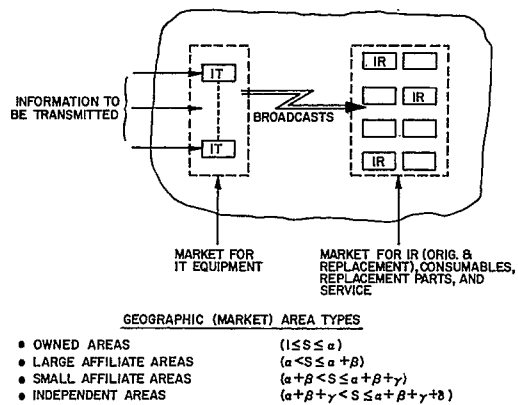


FIGURE 3. GEOGRAPHIC MARKET SEGMENTATION - THE BROADCAST AREA.

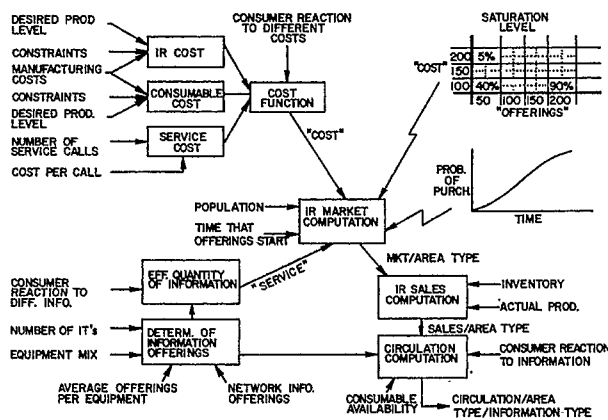


FIGURE 4. BASIC CONCEPT.

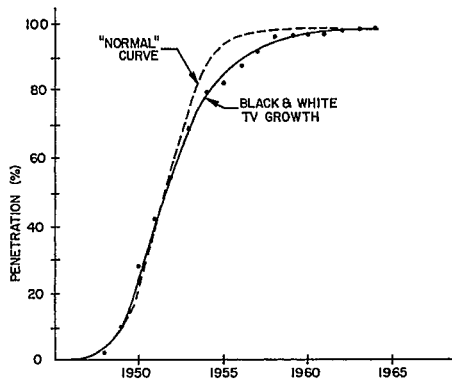


FIGURE 5. GROWTH OF BLACK & WHITE TELEVISION TO SATURATION.

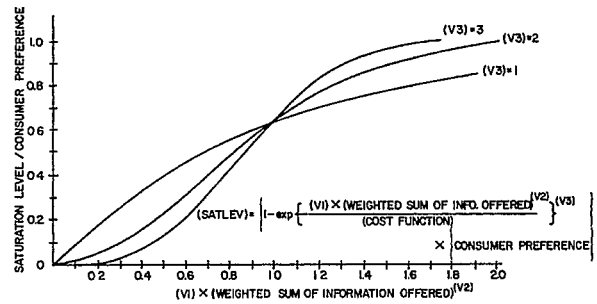


FIGURE 6. INFORMATION RECEIVER SATURATION LEVEL.

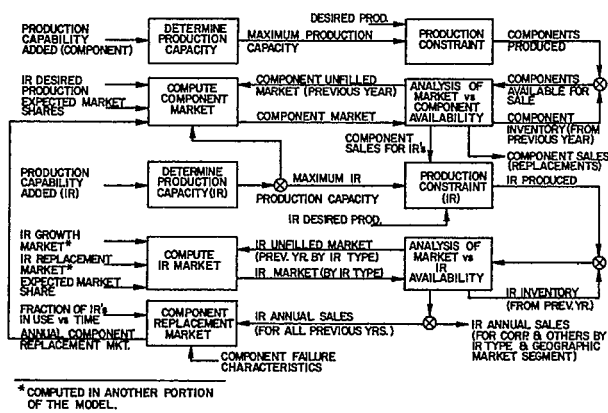


FIGURE 7. PRODUCT INTER-RELATIONSHIPS.

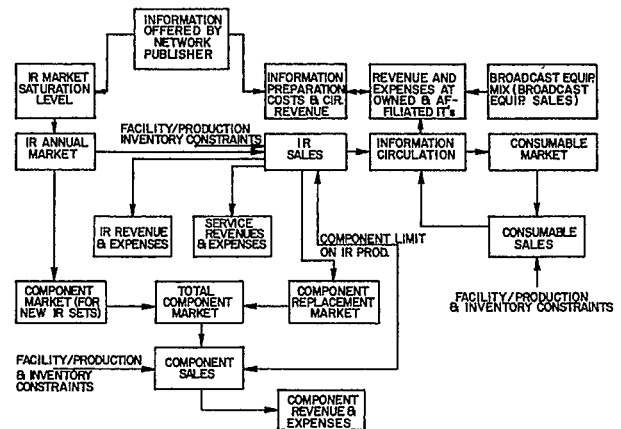


FIGURE 8. SCOPE/INTERRELATIONSHIPS (EFFECT OF CHANGE IN QUANTITY OF INFORMATION OFFERED).

PROFIT & LOSS PROJECTION

NETWORK PUBLISHER

FIGURE 9

| | YEAR | | | |
|--------------------------|------|---|---|----------|
| | 1 | 2 | 3 | 4.....10 |
| ADV. INCOME | | | | |
| LEASED TIME INCOME | | | | |
| INFO. INCOME (OIT) | | | | |
| INFO. INCOME (AIT) | | | | |
| MESS. PREP. INCOME (OIT) | | | | |
| MESS. PREP. INCOME (AIT) | | | | |
| GROSS SALES | | | | |
| USE OF INFO. (OIT) | | | | |
| USE OF INFO. (AIT) | | | | |
| USE OF LEASED TIME (OIT) | | | | |
| USE OF LEASED TIME (AIT) | | | | |
| EDITORIAL COST | | | | |
| COMPOSITION COST | | | | |
| PREP. COST (NET.) | | | | |
| OTHER PREP. COSTS | | | | |
| AGENCY FEES | | | | |
| PRODUCT COST | | | | |
| OPERA. & ENG. COST | | | | |
| PARTS/SERVICE | | | | |
| OTHER COSTS | | | | |
| TRANS. LINE COST | | | | |
| COST OF SALES | | | | |
| ACTUAL GROSS MARGIN | | | | |
| % OF SALES | | | | |
| MARKETING & OPERA. | | | | |
| TOTAL G & A | | | | |
| CORP. ASSESS. | | | | |
| INTEREST | | | | |
| PRETAX PROFIT | | | | |
| AFTER TAX PROFIT | | | | |

Note: OIT = network publisher owned IT
AIT = network publisher affiliated IT.

INFORMATION RECEIVER PRODUCT ANALYSIS

FIGURE 10

| RECEIVER TYPE _____ | YEAR | | | |
|-------------------------------------|------|---|---|----------|
| | 1 | 2 | 3 | 4.....10 |
| DIR. LABOR (\$) | | | | |
| DIR. LABOR (%) | | | | |
| MATERIAL (\$) | | | | |
| MATERIAL (%) | | | | |
| OVERHEAD (\$) | | | | |
| OVERHEAD (%) | | | | |
| IR. MANU. COST (\$/UNIT) | | | | |
| IR. STD. MARGIN (\$/UNIT) | | | | |
| IR. MANU. COST (K\$/YR) | | | | |
| MANU. MARKUP (%) | | | | |
| MANU. SALES PRICE (\$/UNIT) | | | | |
| MANU. SALES (K\$/YR) | | | | |
| DIST. MARKUP (%) | | | | |
| DIST. SALES PRICE (\$/UNIT) | | | | |
| DIST. SALES (K\$/YR) | | | | |
| RETAIL MARKUP (%) | | | | |
| RETAIL SALES PRICE (\$) | | | | |
| TOTAL MARKUP (%) | | | | |
| IR ORIG. EQ. MKT. (K UNITS) | | | | |
| IR REPLACE. MKT. (K UNITS) | | | | |
| IR MKT. GROWTH (BY IR TYPE) | | | | |
| CONSUMER PREFERENCE | | | | |
| IR PROD. BY MANU. (K UNITS) | | | | |
| MANU. IR INVENTORY (K UNITS) | | | | |
| MANU. IR AVAIL. SALE (K UNITS) | | | | |
| MANU. IR SALES (K UNITS) | | | | |
| MANU. IR SALES SHARE (%) | | | | |
| IR PROD. BY COMPETITORS (K UNITS) | | | | |
| COMPETITOR IR INVENTORY (K UNITS) | | | | |
| COMPETITOR IR AVAIL. SALE (K UNITS) | | | | |
| COMPETITOR IR SALES (K UNITS) | | | | |
| COMPETITOR IR SALES SHARE (%) | | | | |