

BHARAT ELECTRONICS LIMITED

Case on Marketing

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Case on Marketing

BEL was established in 1954 with an intention of being a leader in defence electronics and other chosen fields. The main mission of the company is to serve the national needs through quality, technology and innovation. In the initial 20 years it tried to diversify its products at its Bangalore complex. In 1970s it not only diversified the products but also set up two units, one at Ghaziabad and the other at Pune. There was a tremendous expansion from mid-80s when six units were established. Its products were diversified. With a sales of Rs.14 million in 1960-61 it has grown to Rs.7,239 million sales in 1990-91 (see Table 1).

Table 1

Sales:

Year	Rs. mil.
1960-61	14.0
1970-71	263.5
1979-80	829.5
1985-86	1,865.3
1990-91	7,239.1

The growth has been impressive. The percentage share of turnover is still concentrated at Bangalore Complex to the extent of 66 per cent of the total. Ghaziabad unit has 12 per cent and rest of the units are within one digit percentages (see Table 2).

Table 2

Share of Units (1990-91)

Units	Year of Establishment	(1990-91) % of Sales Turnover
Bangalore Complex (BG)	1954	66
Ghaziabad (GAD)	1974	12
Pune (PN)	1979	1
Machilipatnam (ASCO) (MC)	1983	1
Madras (MDS)	1985	5
Panchkula (PK)	1985	8
Kotdwara (KOT)	1986	4
Taloja (TJ)	1986	1
Hyderabad (HYD)	1986	2

Table 3

Concentration of Production
1990-91

Products	Rs. Mils.	% Share of units			
Communication equipment	3,143.2	BG (62.7)	GAD (10.8)	PK (17.5)	KOT (9.0)
Radars	1,672.2	BG (42.0)	GAD (30.5)	MDS (21.0)	HYD (6.5)
Broadcast & TV Eqpt.	1,009.5	BG (99.2)	GAD (0.8)		
Components + TV Glass Bulbs	1,333.6	BG (85.0)	PN (7.2)	TJ (7.8)	
Optics & Opto-Electronics	81.0	MC (100.0)			

Product Mix

Initially BEL started with the defence required equipments like communications and radar related products.

Subsequently it has diversified into requirements of the civilian departments which include non-defence organizations. But it continues to concentrate on the communications segment. The production of major items are divided into five groups viz., communication equipment, radars, broadcast and TV equipment, components & TV glass bulbs and optics & opto-electronics. The distribution of product contribution by different units is given in Table 3. It indicates that communication equipments are concentrated in Bangalore, Ghaziabad, Panchkula, Kotdwara. Components are concentrated in Bangalore, Pune, Taloja.

Table A-5

Market Segments 1990-91

Products	Rs.mil.	Segments			
		Defence	Civil	Components	
(percentages)					
Communica- tion eqpts.	3143.2	75.0	24.0	-	BG, GAD PK, KOT
Radars	1672.2	94.7	5.3	-	BG, GAD, MDS, HYD
Broadcast & TV eqpt.	1009.5	-	100.0	-	BG, GAD
Components & TV Glass Bulbs	1333.6	5.6	-	94.4	BG, PN, TJ
Optics & Opto- Electronics	81.0	84.0	-	16.0	MC
Total (Rs.mil.)	7239.5	4112.8	1854.2	1272.5	
Total (%)	100.0	56.8	25.6	17.6	

Market Structure

Normally the company classifies its marketing into three components viz., defence, civil and components. Under defence it provides equipments to all the divisions of defence, defence supplying departments and para-military forces. Under non-defence it provides equipments to department of telecommunication, Ministry of Information and Broadcasting, Railways, ISRO, ITI etc. These come under civilian segment. The third segment is components where it supplies to mostly private trade manufacturers of TV and radio in the consumer electronic sector.

In 1991 the distribution of defence accounted for 57%, civilian sector 25% and 18% components. The market segmentation of 1990-91 is given in Tables 4 and 5. It provides the product groups and the distribution of market segment as well as units which are supplying these products. The Bangalore unit supplies almost all items, except optics and opto-electronics. The Ghaziabad unit supplies communication equipment, radars and BTV equipments. The Panchkula and Kotdwara units mainly supply service while the unit at Hyderabad supplies radar equipment. The component production is concentrated in Pune and Talaja besides Bangalore. The M Chilipatnam unit concentrates on optics and opto-electronics.

On the basis of this, the market orientation of BEL units is given in Table 6. If one tries to reclassify the market

Table 2

Market Orientation at Present

Units	Market Segments		
	Defence	Civil	Components
BG	X	X	X
GAD	X	X	-
PN	X	-	X
MC	X	-	X
PK	X	-	-
KOT	X	X	-
TJ	-	-	X
MDS	X	-	-
HYD	X	-	-

tries to reclassify the market orientation on the basis of market segmentation units supplying and products supplied by its units, bit gives the following picture.

Table 7

Market Orientation and Products

Market Orientation	Units	Products
All the segments	= BG	All products except optics
Only Defence	= PK,MDS,HYD	Communication Eqpt., RADAR
Defence & Civil	= GAD,KOT	Communication Eqpt., B,TV
Defence & Components	= PN,MC	Components, optics
Only components	= TJ	TV bulbs

Sometimes different units are subject to change in the product mix due to changing market demand. For example, the Ghaziabad unit was started to fully concentrate on radar related products but it was not able to utilise its full capacity due to lack of adequate demand and it was diversified into other products like communication and broadcast BTV equipment. Similarly the Pune unit was initially established for a production of image intensifier and image converter. As there was not sufficient demand it has changed to production of battery in the unit. Sometimes BEL, allots its orders to different units depending on their capacity and utilisation. For some of its major products, there are several units which have come up in India, details of which are given in Table 8.

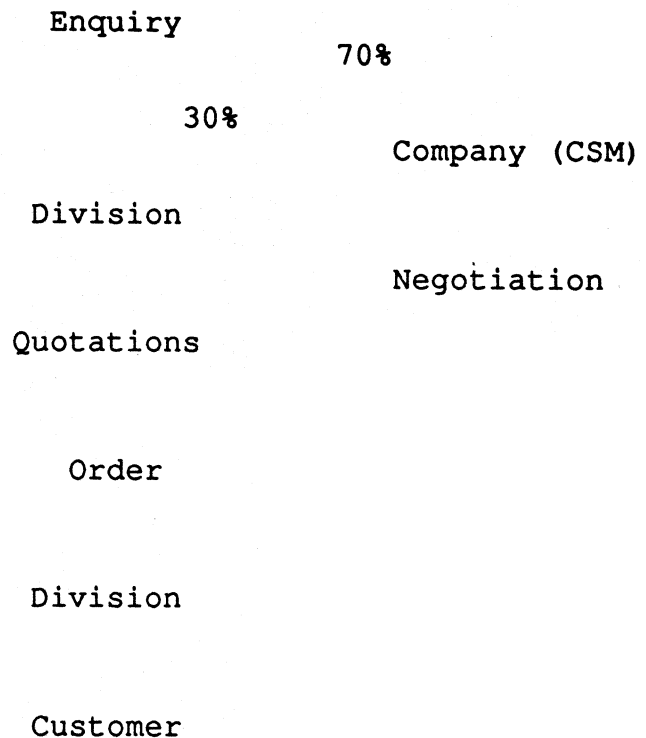
Marketing Process

Marketing Organisation

The marketing set up in BEL is given in Figure 1. Under the Director C&MS there are three divisions - customer co-ordination, marketing centers and corporate commercial. The details of these activities are given in Figure 1. In addition, Bangalore Complex has got a Chief Sales Manager who co-ordinates all the Divisional sales regarding equipments. Each product division has got a marketing cell which includes three executives and 20 non-executives. The nature of activities of the commercial head is given in Figure 2. The commercial system flow is given in Figure 3. The relations between the customer, commercial department and production and sales and accounts department is also given. The general pattern of

marketing process is as follows:

Figure 4
Marketing Process (BEL)



The detailed marketing process on defence related aspect is given in Figure 5. The commercial department involves in four distinct phases viz., pre-order phase, order execution phase, post-sale phase and bill collection. In the pre-order phase it tries to get enquiries from customers, process the enquiries in consultation with other departments. The enquiries may be of different types, either BEL cannot supply or can supply and some are development projects. In the order execution phase it involves receipt of order and acknowledgement, acceptance of order and execution of order. It also follows up with the

post-sale phase like bill collection and after-sales services which may involve repair and replacement work, either at the site or bringing back to the company. It also involves demonstration and customer training equipments to users.

Nearly 70 per cent of its products are professional which means close interaction with the customer is required in exeucting the order. Only 30 per cent are standardised products which can be supplied to various customers. However there is competition both for professional and standardised products. Currently only 40 per cent of the market can be said to be suitable because of close interaction between the defence requirement and production of BEL, while some of the requirements of civil and others are also facing competition due to entry of new producers in the market.

Figure 5

Defense Related Marketing Process
(18-36 months)

Initial Order

J.S. Q.R. (informal)

B.E.L.

R&D Sales
(Technical) (Commercial)

TCA (Tech. Coord.
authority)

Evaluation

User Maintenance R&D
 (BEL)

QRE (Finalised)

Order (small no.)

BEL (R&D)

[Develop product
+ test]

Customer Inspection (test
QR specs.)

Defense (Service Dept.)

Inspectorate User
Tech. Trials
Evaluation

Maintenance
Agency

Bulk Order

BPC (Bulk Production
clearance)

Order -- Engg. Documents
(R&D)

Product
Division
Executed -- 1. Equipments
2. MRLS
(Mftr. recommended
List of spares
for 48 months)
3. Test equipment
+ zigs
4. Tech. Manuals

Training -- 1. For users
2. For maintenance
staff

Sales -- Guarantee
15 months

After Sales Service

BEL Call Back
on site equipment
Repair at BEL

Marketing Cost

The cost trend is given in Table 9. Nearly 7 per cent

Table 9
Cost Trends: (1989-90)

Gross Sales: Rs.6,452.1 mil.	%	100.00
Less: - Excise Duty	6.06	
- Freight forward	0.03	
- Selling expenses	0.97	
	-----	7.04
Net Sales Realization		----- 92.96 -----

	Rs. mil.	% of	
		Gross Sales	Net Sales
Gross Sales	6,452.1		-
Net sales realisation	5,996.3	92.9	
Cost of sales	5,551.1	86.0	92.6

Ad. expenditure = Rs.13.9 mil.

Turnover and Debtors (March 1990)

	Rs. mil.	% of sales
Sales	6,452.1	100.00
Book Debts	1,616.0	25.05
- Good	1,554.8	24.09
- Doubtful	61.2	0.96

Break-up Debts: (more than one year)

	Rs. mil.	% share
Total Debt.	230.8	100.0
- Govt. Department	213.3	92.5
- Govt. Cos.	12.9	5.5
- Private	4.6	2.0

of the gross sale in 1989-90 was due to excise duty, freight forward and selling expenses. If one takes net sales realization to gross sales, it was nearly 93 per cent, while cost of sales on gross sales comes to 86 per cent while in relation to net sales it is 92 per cent. In addition, nearly 25 per cent of the sales were in book debts and nearly one per cent was doubtful debts. However, majority of the doubtful debts are with the government department itself. The reasons for this are either the bills are not forwarded or there was some discrepancy in the supply of spare parts and after sales service. The selling and distribution expenditure as on March 1990 is given in Table 10. Nearly 3 per cent of the total sales in 1989-90 was classified under selling and distribution expenditure, i.e., almost Rs.200 million.

Table 10

Selling and Distribution Expenditure

Year Ended: March 1990

	Rs. mil.
- Printing and Stationery	21.9
- Discounts, Allowances & Rebates	46.6
- Advertisement & Publicity	13.9
- Travelling expenses	55.0
- Packing & Forwarding	61.8

Total	199.2

% of Sales: (Rs.6438.2 mil.)	3.09

Issues

The market share for BEL products compared to 1976 has declined from 17 per cent to 5.9 per cent. In some of the relevant sectors it has declined from 29 per cent to 14.5 per cent. Most of the decline is in the communication market. This is mostly due to the product range as BEL is not producing EPABX. Several defence and civil segments of paramilitary nature have been supplied by state sectors and some private companies. There is an apprehension even in radar market other public enterprises and private enterprises may enter. In the components field also it has declined from 23 per cent to 5.4 per cent in 1976 and 1990 respectively. The current problems faced by BEL products can be summarised as follows:

Table 11

Current problems Defense

Effect on BEL

- | | |
|---|---|
| - Attempt to Multi-source
(Eg. battery) | - Unfair price-war, delays in
orders |
| - For export clearance of
Defence Department
(Eg. Iraq 1978-84) | - Limits exploration of
export market |
| - Clearance every order | - Reaction to query delay,
sample not possible |
| - Requirements one
generation gap in
technology | - Technology introduction
delayed |

Civil

- | | |
|--|---|
| - Delay in placement of
orders (Eg. Afro-
Asian Game equipments) | - Accumulation or storage of
inventory |
| - Small order | - High cost of product
development |
| - Related components
supply | - Avoid trading other
components |
| - Specific customer need | - Slow reaction of R&D |
| - Competition (calculators) | - Marketing failure |
-

BEL - CASE ON EXPORT

Export Performance

BEL was established in 1954. By 1990 it started entering the export market in components. During the decade of 1980s exports showed a varying performance. It gradually increased from Rs.65 million in 1980-81 to Rs.130 million in 1982-83. Again it started declining and it was as low as Rs.1.8 million in 1985-86. Then again it started increasing - by 1989-90 the total export was 170 million (see Table 1).

Table 1

BEL: Exports 1980-90

Rs. mil.

Year	Direct	Deemed	Total	Units
1980-81	65.7	0.07	65.8	BG,GAD
1981-82	107.8	-	107.8	BG
1982-83	130.4	0.01	130.5	BG
1983-84	57.9	-	57.9	BG,MC
1984-85	40.4	-	4.4	BG,MC
1985-86	1.8	-	1.8	BG
1986-87	3.5	0.01	3.5	BG
1987-88	10.0	0.02	10.0	BG
1988-89	38.4	-	38.4	BG,MC
1989-90	50.0	110.0	170.0	BG,MC

The deemed exports also shows an erratic trend. Though initially there was an attempt to enter in 1980-81, this picked up only in 1989-90 to have a significant figure of Rs.110 million. Table 2 gives the latest figures of BEL turnover and exports which shows that direct export accounts

Table 2

BEL Exports

	Rs. mil.	as % of total
Total Turnover (1989-90)	6,452.1	100.0
Direct exports:	50.0	0.77
Deemed exports:	110.0	1.70
Forex: Outgo:	2,003.0	31.04
Inflow:	48	0.74

for less than 1 per cent. If one includes deemed exports, it will come to 1.7 per cent of the total turnover in 1989-90. If one views BEL export performance in relation to foreign exchange earning to expenditure, it becomes insignificant. More than 31 per cent of the total turnover depends on imports, while exports account for less than one per cent. In the whole of 1980s most of the exports of BEL was components, except for initial exports of defence/civil communication equipments and radar. Details are given in Table 3. From 1988 onwards there was a break through in the exports. In addition to components it also started products which are common equipments between defence and civil sector such as:

- : Radio communication network - Mauritius
- : Sub-units of Radars - Switzerland
- : Optical items - W. Germany
- : Digital communication interface - Sweden
- : Sub-assemblies of Radar - Netherlands
- : Transmitting Tubes - General countries

Table 3
Product Mix

Defence/Civil	Components
HF: Communication Equipment	- Receiving valves
IFF System (Radar)	- Germanium/Silicon semiconductor
	- IC
	- Transmitting/Magnetron/Indicator Tubes, Crystals
	- X-Ray Tubes
	- B&W TV Tubes
	- VCO
	- Electron guns

Most of the defence civil sector equipments were sold to Iraq, Yugoslavia and Bangladesh, while the components were exported to difference countries and every year the composition of countries has been changing - some are developed countries and some are Australasia and African countries. Even the deemed exports are mostly to Eseepez. The pattern of exports indicate that BEL has not been able to have a consistent relationship with the customer. As such it appears it has acted as a militancy supplier of components to the customers.

Organizational Setup

BEL realized the importance of exports and gave the priority area for the company and set up an export cell for each production division/unit in major units of the company. It also created an export cell called SOFEX (software exports) in 1990. In 1991 they are rechristening the export

department as international marketing division to look after the export aspects of the company. This is set up at the corporate office which comes under the control of Director (C&MS) and it is centralised to look after the exports of the units of the company.

Export Channels

It uses several methods to achieve its export targets. There are different channels used by BEL in its export attempt. Firstly it uses agents abroad. They are appointed on an yearly basis and mostly it is based on the transaction. Secondly it uses the Indian export houses such as Tata exports, STC and so on for getting the orders for its products. Thirdly it has got its own small office in US and Singapore. Fourthly it also scans global tenders and tries to respond through the international marketing division which monitors and takes up the follow-up action on tender enquiries, negotiations and finalisation of orders with overseas customers. Fifthly Recently BEL has signed MOUs with one American and Singaporean company for development and marketing of software products. Sixthly, it has set up an 100 per cent export oriented unit as a joint partner with Oldelft of Netherlands.

Export Promotion

International Marketing division is responsible for export promotion and publicity. Most of these are done through

- participation in international execution
- preparation of promotional literature and audio-visuals
- advertisement in international media
- arranging promotional visits and demonstrations abroad
- inviting and arranging visits of foreign customers to BEL
- coordinating with other export promotion agencies and government departments.

Future Strategy

BEL is planning the following in the near future:

- 1) Concentrate on marketing of "mature products". These are determined on the basis of bug-free, short delivery periods and lower cost. In addition, BEL also wants to concentrate on equipments/systems/technology/turnkey projects, besides software exports.
- 2) BEL wants to concentrate on South East Asian and Middle East where they do not have the defence electronic industry
- 3) It wants to use the various export houses for promoting its products like PEC, Tata exports etc. It also wants to employ agents in other countries.
- 4) BEL wants to try to have buy-back arrangements with erstwhile licensors such as
- 5) It also wants to involve much more vigorously in international exhibitions and advertisements as well as demonstrations for the potential customers.

CASE ON R&D MANAGEMENT

Organization

BEL was established in 1954 but R&D department was started in early 60s. The R&D activities were directed towards development of military and civil communication equipment from broadcast and television transmitters and studio equipments, radars, solar and foreign control systems. BEL felt the need of having a long term thrust on R&D activities particularly in the areas of signal processing, information technology and computer systems. With a view to centralise these radar activities, BEL established the Central Research Lab., at Bangalore in 1988. However, it is planning to open another centre CRL at Ghaziabad.

Currently it has about 662 engineers and scientists and 860 supporting staff. The total R&D staff accounts for 7.86 per cent of the total personnel of BEL. During 1980s there was an increasing trend of expenditure on R&D efforts. In absolute terms it has increased from Rs.105 million in 1982 to Rs.345 million in 1991. However, as a percentage of total turnover it has declined from 8.2 per cent to 4.8 per cent in the corresponding years. The details of the expenditure during the decade are given in Table 1.

R&D department is attached to each division and unit in the company. They closely interact with production, industrial engineering department and commercial departments. R&D department provides sufficient information to commercial

Table 1
R&D Expenditure

Year end March	Expenditure Rs. Mil.	Expenditure as % of turnover
1982	105.6	8.22
1983	105.7	7.43
1984	125.7	8.11
1985	153.9	8.20
1986	127.4	5.80
1987	125.6	4.25
1988	179.2	4.74
1989	267.2	5.36
1990	306.7	4.75
1991 (provisional)	345.0	4.79

departments for its activity. Similarly to IED for their estimation of cost, it also provides GEL/MRLS at the time the equipment is ready for trials or evaluation. They undertake demonstration of new equipment to the customers to speed up procurement of orders. Besides, it actively participates in the trial and evaluation of new equipment and speeds up the bulk production clearance.

Pattern of R&D Management

There are four industry related activities in R&D management. They are:

- Inhouse R&D
- Joint efforts with DRDO/CSIR organizations
- Foreign licensing agreement
- Transfer of technology

Inhouse R&D

Since 1960s it has carried out several designs with the R&D efforts within the company. Some of the products are as follows:

- Plan Aren of the Army - HF/VHF/UHF Transreceivers, UHF Microwavce radio relays, encryption equipment, data terminals, trope terminals, HPTX, fibre optic communication systems, MIL switching products.
- A wide range of surveillance, surface attack and navigational radars, video console system, composite communication systems, fire control systems, tracking radars, modular databus, toted, sonars etc., for the Navy.
- Plan adges of the airforce - line of sight and tropo-scatter communication systems, MIL satcom systems, 3D mobile radars etc.
- A wide range of sound and telecast equipment for transmission and studio use for information and broadcasting .
- Variety of communication equipment for major users like police paramilitary forces, D.O.T., VSNL, MET Dept., civil aviation.
- Tank fire control and drive system, EW systems for all the three forces on various platforms.
- Optical instruments and laser based product.

Wide range of components developed include many types of:

- Transmitting tubes & X-Ray tubes
- Microwave tubes
- Crystals, crystal filters and TCSOs
- Hybrid micro-circuits
- Liquid crystal displays
- Monochrome monitor tubes
- PTCR
- Ultrasonic delay line

- Ceramic transducers
- MgMnO₂ Batteries

All these products again have nearly 74 per cent of the products of the company's total turnover.

With the establishment of Central Research Lab (CRL) BEL wants to build up good scientific and technological foundation necessary for the company's efforts. It is established with the objective of making BEL a leader in electronic technology and competitive in the international markets. They intend to develop new ideas and concepts to improve the products, develop new materials and technologies. It was earlier set up with an intention of coordinating with academic and research institutions to better utilise the given resources and disseminate R&D information throughout the company. CRL will be involved in the joint efforts with DRDL and CSI organizations. Currently there are 19 institutions which are involved in development of products relevant to BEL.

- | | |
|-----------------------|--|
| 1. L.R.D.E. Bangalore | - TIDEX, AES, INDRA, ACME-MD |
| 2. D.L.R.L. Hyderabad | - IFF, EW SYSTEMS, DATA CYPHER EQUIPMENT |
| 3. I.R.D.E. Dehradun | - PASSIVE NIGHT VISION BINOCULARS/ GOGGLES & LASER RANGE FINDERS |
| 4. N.P.O.L. Cochin | - SONARS, TOTES, HUMVAD, PANCHEN-DRIYA TRANSDUCERS |
| 5. B.A.R.C. Bombay | - IMAGE CONVERTORS |
| 6. I.I.Sc. Bangalore | - MgMnO ₂ BATTERIES |
| 7. I.S.R.O. Bangalore | - SPACE ELECTRONICS EQUIPMENTS |

8. Raman Research Institute, Bangalore - LIQUID CRYSTAL DISPLAYS
9. T.E.C. (T.R.C.) Delhi - UHF DIGITAL RADIO RELAY, PCM EQPT.
10. CEERI, Pilani - MICROWAVE TUBES
11. D.R.D.L. Hyderabad - MISSILE GROUND SYSTEMS
12. N.A.L. Bangalore - AUTOMATIC VISUAL RANGE ACCESSOR
13. A.D.E. Bangalore - SIMULATORS & TRAINERS
14. ASIEO, Bangalore - EW (AIRBORNE) SYSTEMS
15. N.S.T.L. Vizag - TORPEDOES, PANCHENDRIYA
16. C.DOT, Delhi - RAX, MAX
17. SAMEER, Bombay
CSIO & PGIMR,
Chandigarh - LINAC MEDICAL ELECTRONICS
18. R.E.C. Warangal - OPTICS
19. I.I.Sc. Bangalore - MATERIALS DEVELOPMENT (PROPOSED)

Since the beginning up to 1989 BEL had 56 foreign licensing agreements (see Table 2). There were major licensing

Table 2
BEL: Foreign Licensing Agreements

Years	Numbers
1954-59	4
1960-64	17
1965-69	11
1970-74	8
1975-79	--
1980-84	13
1985-89	3
Total	56

agreements during the 1960s and they declined in 1970s. Again there was a spurt in licensing in the beginning of 80s. The type of products and the company which was collaborating in the products are given in Table 3. This indicates that

Table 3

BEL: Licensing Agreements

Collaborator	No. of Times	Products
Siemens, W.G.	13	- SSBTX IKW (1961), 5KW (1964) - ISBTX 3KW (1964) - 400 WTX (1965) - RX (1965) - FSE 30 (1965) - Ancillaires Products (1965) - Radio Tel. (1966) - X-Ray Tubes (1964) - FM 200 (1970) - Biangular X-Ray Tubes (1981) - Vacuum Switching devices (1983) - Vacuum Interrupter Tubes (1983)
NEC, Japan	8	- MW TXS (1,10 & 100 KW) (1960) - Tape recorder (1961), - S.298 (1963) - TXG Valves (1965) - TV Picture Tubes (1968) - TV Transmitter (1971) - Ceramic Envelope (1974) - DMS 6/13 GHZ (1988)
Philips, Holland	3	- Radio Receiving Valves (1959), Semiconductors (1961) Magnetrons (1967)
RCA, U.S.	3	- AN/PRC-25 (1964) - IC, Semiconductors (1971), IC (1983)
Robert Bosch, W.G.	2	TV Operations (1983) Colour Camera (1983)
Marconi, U.K.	2	- HM 100/150 (1959), AD 722 Radio Direction Finder (1960)
Varian, U.S.	2	- RF Power Transistor (1983), Microne Tubes (1984)

A.T.E. U.K.	2	- B-210 RX (1962), C-41TX RX (1965)
CSF, France	2	- CSF products (1952), Radar (1971)
PYE, U.K.	One each	- W.S. 62 (1959)
Benedix, U.S.A.	(Total	- Aviation Eqpts. (1961)
Contraves, Swiss	19)	- F.C. Radar (1961)
AEI, U.K.		- Gun Control Eqpts. (1961)
Redifon, U.K.		- M.F. Beacons (1962)
Mullard, U.K.		- C IITx (1962)
Plessey U.K.		- C-42 TX/RX (1962)
Racal, U.K.		- Rxs (1962)
Signaal, Holland		- Frigate Radars (1969)
Salenia, Italy		- Marine Radars (1970)
Fernsch, W.G.		- TV Studio Eqpt. (1971)
Dynamic Corp. A. U.S.		- Troposcatter (1971)
Thorn EMI-U.K.		- Locating Radar (1982)
Corning Glass, France		- B&W TV Glass bulbs (1982)
Brown Boweri, Swiss		- RF Power Tubes (1983)
CTC, U.S.		- Silicon Semiconductor (1981)
Wilhelm Albrecht, W.G.		- Sound Followers (1984)
HSA, Holland		- Fly Catcher Radars System (1985)
LCTAR		- Stentor (1987)

majority of licensing was taken from Siemens, West Germany and NEC, Japan. They accounted for more than 21 licensing agreements. Nearly 19 agreements were for individual products from different companies. Currently there are 20 licensing agreements which are in operation (Table 4). Except for 5 agreements for production of components, rest of the products are related to the requirements of defence and civil departments.

Technology Transfer

One of the commercial policies of the company is to transfer knowhow horizontally to other Indian parties. Transfer of technology (ToT) may take two directions viz., there may be a request from the state electronic sector or

Table 4
Current Licence Agreements (1991)

Country	Collaborator	Depts.	Products
U.S.A.	Harris	Com.	ICs
	Varian	Com.	Microwave Tubes
	Scientific	CD	Flyaway Satellite
	Atlanta		Earth Stn. & Hub-
			Stn. Electronics
	Micro source	CD	Micro-wave
			components
			(synthesizers)
W. Germany	Siemens	Com.	Vacuum
			Interrupters
	Broadcast	CD	Colour cameras,
	TV system		Telecine for
			studios
	Rohde &	CD	FM Transmitter
	Schwarz		
Holland	HSA	D	Flycatcher Radar
Switzerland	Brown-Boveri	CD	- RF Power
		CD	Tetrodes
			- MW&SW Broadcast
France	LCT	D	Stentor (Radar)
	Thomson-CSF	D	Mobile 3D Radar
U.K.	Barr & Stroud	D	Tank Laser sight
	Continental	CD	100 W UHF TV
	Microwave		Transmitter
	English	D	Mini Magnetron
	Electric		Ka Bank
	Value Co.		
Japan	NEC	CD	6, 7 & 13 GHz ₂
			Digital Radio
			Relays
	Ikegami	Com	Charge coupled
			Device
	Tsushinki		(Cameras)
Canada	Central Dynamics	CD	Prodn. Switcher
Sweden	Ericson Group	Com.	IC for push
	- Rifa		button telephones
	- Radar	D	Monopulse Radar &
	Electronics		DMTI for SFM
			update

Departments: Com = Components; CD = Civil Departments,
D = Defence

private undertakings identified by them. They may send the request to BEL for ToT. Secondly, BEL itself may identify the lower end of technology and try to offload to others. This means BEL will scout for the manufacturers but prefer to have ToT from them. Most of these are handled by AGM (Products and Licensing). He will have a continuous interaction with divisions or units to identify the products or technology for licensing to others. The major factors considered are:

- Insufficient capacity within BEL or not willing to create capacity
- BEL intends to the product line
- There may be government pressure to off load some of the products
- By transferring technology the royalty payments may be commercially viable
- The ability to support ToT by BEL.

Most of these commercial activities are done by the AGM (Products and Licensing).

Currently there are 18 technology transfers by BEL as given in Table 5.

Cost and Benefit

The total cost of the R&D effort as a percentage of sales in 1989-90 was 4.6 per cent and royalty payment was 3 per cent of the total sales of BEL. As a result of this expenditure cumulatively BEL was able to incorporate the inhouse R&D efforts into production of nearly 74 per cent of

Table 5

Transfer of Technology

Products	No.	Organisations
1. Language Lab.	1	Acoustics Ltd.
2. Studio Type Amplifiers	1	Webel
3. Exciters for TV Transmitters	3	GCEL, Keltron, ECIL
4. VHF D/F Receiver	1	GCEL
5. PC Multiplex Eqpt.	2	Meltron, Mace
6. MF Radio Beacon	1	Mace
7. TV Picture Tubes	1	Suchitra Teletubes
8. TV Deflection components	1	OSDC
9. Silver paste composition	1	JV Electronics
10. Glass compositions	1	Electronic glasses & industries
11. Voice Frequency Telegraphy Eqpt.	1	WS Industries
12. TO-92 Transistors	3	Sikkim Time Corp. Keonics, Goa Electronics
13. Germanium Transistors	1	GARG Associates

the sales turnover and the rest is due to foreign collaboration. In addition, it has been able to introduce nearly 11 per cent of the new products during 1989-90 due to inhouse R&D efforts. Besides, it has indigenised many products and indigenisation of components equipment the company was able to achieve a level of Rs.30 million in 1989-90. some of the major items include ICs, Inhouse, Nickel,

cadmium etc. It plans to increase the indigenisation target for the next year up to 50 million.

Result of R&D

New Products: - V/UHF Transreceiver
 - VHF Military Manpack
 - Mobile Troposcatter system
 - Radars
 - Simulators
 - 10 KW TV Transmitter
 - Microwave Tubes for SATCOM applications

Table 6

Cost and Benefit (1989-90)

	R&D inhouse	Foreign collaborations
<hr/>		
- Cost as % of sales	4.6	0.3
- Sales of products (%) total	74.0	26.0
- New products % of total sales	11.0	

Current Position

During 1991-92 BEL anticipates less defence order compared to production capacity of the company and it may lead to under utilization and specifically so to Machilipatnam unit producing opto-electronics. With all the efforts of BEL, one can summarise the technology position and the present issues as given in Table 7.

Table 7

<u>Technology</u>	
<u>Position</u>	<u>Present Issues</u>
- Strong R&D base	- not extended to allied technology
- R&D monitored twice a year with DRDO	- slow reaction of R&D to customer need
- Meet in-house requirement	- competitive technology BEL lacks marketing efforts eg. calculator
	- wide range of technology not concentrated
	- not able to exploit technology - offshoots (spin-offs)

Future Plans

In order to have a competitive edge in the market place, BEL is required to identify new products on the basis of customer needs and maintain its high quality product. The future plan on the basis of market orientation other than the defence area, it has classified current product groups, whether it wants to either try to penetrate the new markets or increase the share of the existing markets and diversify into related electronics field (see Table 8). On the basis of the market orientation the R&D efforts which are required by BEL is given in Table 9, where it is identified into three groups, long term thrust area, mostly in defence and civil departments, the trust area and the area where it requires to

Table 8

Future Plans

Areas of focus (other than Defence)

Penetration	Increase share	Diversification
- Civilian CD communication equipment	- Broadcasting CD equipment	- Medical CD electronics
		- Cordless phones & ATMs
- Switching CD	- Active CD Components	- Control instruments and Indl. electronics
- Transmission CD	- Electron Tubes	- Computer peripherals
	- Semiconductors	- System Engg. D&CD
		- Automobile electronics
		- Turnkey Operations

Table 9

R&D: Long Term Thrust

Thrust areas	Enhance knowledge	Application Areas
- Military and communication equipment	- Signal processing D&CD	- Digital transmission D&CD
		- Embedded computers D&CD
- Broadcast & TV transmitters, studio equipment	- Information technology D&CD	- Radar signal processors D&CD
	- Computer systems D&CD	- Networking D&CD
- Radars	D	
- Sonars	D	
- Fire control systems	D	

enhance knowledge and some areas for application of the new ideas. The pattern of absorption of technology are as follows:

Absorption of Technology

Thrust Areas: - inhouse R&D, Cooperation with DRDO Labs.

- Foreign Licenses: Semiconductors, Opto-electronics, Military systems

Enhance Areas:- Central Research Lab. at Bangalore

- --Similar are at Ghaiabad/New Delhi
 - design of feeds
 - antenna systems
 - micro-wave sub-systems
-

Orders Position: (1991-92)

- Defence orders lower than production planned
- Underutilisation capacity
 - Machilipatanam unit (Opto-electronics)

Indigenisation

	<u>Rs. mil.</u>	<u>Items (1989-90)</u>
1989-90	30	- ICs
1990-91 (planned)	50	- Handset
		- Nickel cadmium Batteries for HB sets

- Composi tion of Sales (1990-91)

	% of turnover
Defence	57
Civil	25
Components	18

	100

Rs. mil.	7,239.1

Market Structure

Product Groups	Market Structure	Customer-base
Radar	Monopoly	Defence
Communications	Oligopoly	Defence + Civil
Components	Competition	Civil

Other Characteristics
% of Sales

70 : Professional (close interaction required)
30 : Standardised products

Present Competition
% of Sales

40 : Stable market
60 : Competition

Marketing Strategy

Defence: informal interaction
Others: take it or leave it

ED

GM Equipment

Divisions	BTV	DC	Naval Equip- ment	Low-power Communica- tion Equipment	HF	Transformer Service Division	----- CSM -----
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AGM/DGM

Sales
Department

GM

CSM

Marketing

Exports
HQ

Technical
literature

Product Divisions

Marketing Cells

3 Executives

20 Non-executives

Export Department: set up 1988-89

: export cell in each production Division/
unit

Current Exports:

- B&W TV picture tubes
- Break-through:
- New thrusts:
 - : Equipment/Systems/
Technology/Turnkey projects
 - : Software exports - U.S. & Singapore Co.
- : Export Cell (SOFEX) 1990

Methods of Export Promotion

- Agents in various countries
- Participation in exhibitions
- Global tenders
- Promotion tours
- Customer demonstrations
- Personal visits
- Foreign delegations to the company

Diversification

- 100% EOU Joint venture with Oldelft of Netherlands

Action Agenda

- Focussing on core competence
- Forging relationships with erstwhile licensors
- Create a marketing cadre
- Pursue Total Organisational Quality Enhancement (TORQUE)
- Continuous incremental improvements and mastery over emerging technologies

Required

- Product identification
- Quality
- Competitive in the market place

R&D expenditure

	<u>Rs. mil.</u>	<u>% of turnover</u>
1989-90	306.7	4.75
1990-91	345.0	4.79

Personnel

		<u>% of total</u>
662	Engineers & Scientists	
860	Support staff	7.86

1,522		

R&D

Est. 1960s

- 1988 Est. Central Research Laboratory

Company's Product Profile (1990-91)

	<u>% of turnover</u>
Wholly company developed products	64
Partial/collaborated	10
Collaborators design	26

	100

R&D Management

- In-house R&D: -- CRL
- Joint efforts with DRDO/CSIR Org. (about 19 projects currently 1991)
- Licence Agreement (Foreign collaboration: current 20)
- Transfer of Technology (13 so far to other orgns.)

- Royalty & Technical Assistance: 20.4
- % of sales 0.3
- Products covered under foreign licence agreements account for 26% of sales turnover

Sales (1989-90)

	Rs. mil.

Total sales earnings	6452.1
Sales	6438.3
Services	13.8
Services % of Sales	0.2

Customer Profile

Customers

Equipment

- Defence
 - Defence PSUs
 - Para military forces and police
 - Non-Defence (Civil)
-

Components

- Civilian Sector
- Consumer electronics sector
- Spares to equipment customers

Main Products

Defence

- Communications
- Radars & Sensors
- Fighting vehicle equipments
- Others

Civil Depts.

- Communications
- Radars
- Broadcasting
- Space electronic items

Components

- Passive components
 - Semi-conductors & ICs
 - Electron Tubes
 - Opto-Electronics
 - Others
-