

# BusinessWorld

the magazine for Indian business

**The  
hi-tech gift  
of Sam  
Pitroda**

**The textile industry's  
deepening malaise**

Satyen ('Sam') Pitroda  
Advisor  
Centre for Development  
of Telematics

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**BusinessWorld**

the magazine for Indian business

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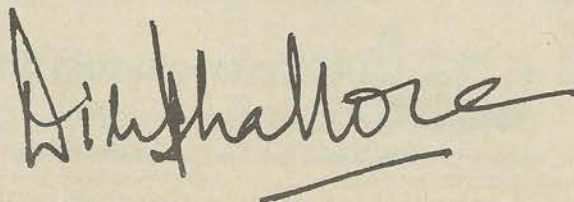
Regular readers of *BusinessWorld* are no doubt familiar with the hatred, ridicule and contempt that I harbour for the foolish case-by-case industrial licensing and regulation laws which govern Indian industry. One of the numerous infirmities of this regimen which invests business-illiterate bureaucrats with the power to take decisions which should properly be taken in corporate boardrooms, is that it discourages the growth and development of indigenous technology. By training and temperament, bureaucrats tend to be precedent-oriented. Therefore the entrepreneur or technocrat who proposes the utilisation of relatively untried indigenously developed technology — no matter how appropriate to local conditions it may be — is likely to be given short shrift. This explains why, despite churning out tens of thousands of highly qualified engineers every year, Indian industry has few inventions or indigenously developed technologies to boast of.

This impenetrable wall of bureaucratic apathy confronted Satyen ('Sam') Pitroda when he proposed the development of indigenous technology to manufacture hi-tech digital switching systems for the nation's antiquated telecommunications sector. That Pitroda was a millionaire entrepreneur who had made his fortune by developing telecom technologies and products in the US — the world's most competitive market where industrial licences and official favours are unheard of — didn't impress them. It took four years and the entry of Rajiv Gandhi into Indian politics to get the idea of setting up the research-oriented Centre for Development of Telematics (CDOT) off the ground.

There are many things — too many — that Rajiv Gandhi has done wrong. But there are some things he has done right. Backing the CDOT project and Pitroda is one of the latter. Nevertheless, Pitroda was given a stringent time and cost limit of 36 months and Rs. 36 crores to develop an indigenous digital switching system. And all the indications are that he will deliver. *En route* to designing the systems for larger-scale main automatic exchanges (MAX), the youthful CDOT team has already developed the technology to manufacture unique Indian environment-adjusted 128-line rural automatic exchanges (RAX) and large 88-line EPABXS (electronic private automatic branch exchanges). Given that MAXs are little more than scaled up versions of these smaller exchanges, Pitroda and CDOT could be said to have already succeeded in developing digital switching systems indigenously.

Who is Pitroda? What are his antecedents? And what is the managerial style of this charismatic can-do entrepreneur who has inevitably aroused the wrath of India's 'can't-do' bureaucrats and percentage politicians? For this fortnight's cover feature, *BusinessWorld's* Delhi-based assistant editor Anand P. Raman has written an engrossing and detailed report on a rare technocrat who has taken up a challenge and delivered.

And in our second lead feature, our Bombay-based correspondent Sutanu Guru focuses the spotlight on the indigenous textile industry in which the brave new textile policy notwithstanding, things are going from bad to worse.



# The hi-tech gift of Sam Pitroda

By ANAND P. RAMAN

Pitroda with the youthful CDOT team, prime contenders

Against all the odds, the started-from-scratch Centre for Development of Telematics (CDOT) has designed an entire range of digital switching systems which promise to revolutionise India's antiquated telecommunications system. Yet the controversial personality of Satyen ('Sam') Pitroda, the moving spirit behind CDOT, could trip up this unique institution as it enters the last lap of the great telecom technology development race.

**T**he wisdom of hindsight indicates that it was a gamble well worth taking. At the end of the 36-month time-frame that — to its credit — the Rajiv Gandhi administration gave it against all advice to design and engineer appropriate state-of-the-art digital switching technology for the country's ramshackle telecommunications sector, the Centre for Development of Telematics (CDOT) has delivered the goods.

Flagged off on 25th August 1984, with the odds heavily weighted against it, the started-from-scratch centre has emerged as the prime contender for supplying the entire range of digital switching systems, which promise to revolutionise India's antiquated telecommunications sector by the turn of the century. Not only have the 375 engineers at CDOT all but completed the design of a whole family of electronic switching systems — from

electronic private automatic branch exchanges and rural automatic exchanges to main automatic exchanges — they have also gone many steps further by ensuring the quickfire productionisation of CDOT technology. As is evidenced by the recent (13th August) commissioning of the IIT-CDOT pilot production facility at Bangalore — which is likely to be the logical stepping stone to CDOT bagging the contract to provide the technology for the country's second electronic switching systems plant also to be sited at Bangalore — by the Union minister for communications, Arjun Singh, CDOT has managed to stay well ahead of its vociferous pack of critics. Even more crucially, the proclamation of a second three-year (1987-90) mission for CDOT, which envisages the centre developing the technological prerequisites for an integrated systems digital network of the future, indicates that CDOT has emerged as a formidable force to reckon with in the indigenous foreign multinational-dominated telecom industry.

While the tangible benefits of the still untested CDOT technology will take a while to percolate through the nation's chaotic telecommunications system patched together over the years, the immediate significance of CDOT's achievement is that it provides the first admissible evidence that India's technocrats can rise to the challenge of bridging the technology gap, given a facilitative environment. With a smattering of similar research centres slated to mushroom in the near future, the importance of CDOT is that it may well emerge as the great white hope of the third world in its race for technological self-reliance.

And by common consensus the man behind the unique success of CDOT is Satyen ('Sam') Gangaram Pitroda (44). Taking advantage of his access to the nation's new-generation, technology-friendly prime minister Rajiv Gandhi, Pitroda has pushed his mission to indigenise and modernise India's embarrassingly backward telecommunications network. Engineer, manager, entrepreneur and a dollar millionaire in his own right, Pitroda has ridden roughshod over the nation's powerful imported technology-dependent politico-bureaucratic fraternity to make CDOT a reality. "This is the challenge of my life," he declares in tones that do not brook argument about the centre's success.

But though the charismatically can-do Pitroda — who made his fortune in the US by promoting several telecom equipment manufacturing companies and selling them to American conglomerates such as Rockwell and AT&T among others — undoubtedly deserves a major share of the credit for getting the hi-tech CDOT project



Pitroda: "challenge of my life"

off the ground in record time, he acknowledges that CDOT is not a solo effort. Backing him to the hilt within CDOT are two determined telecom specialists — G.B. Meemamsi and Dr. M.V. Pitke — who had hitherto ploughed a lonely furrow for much of their working lives in the cause of modernising India's telecom sector through the development of indigenous technology. It is this troika which despite — or perhaps, because of — its vastly different chemical composition, constitutes the brains trust of CDOT.

Yet it is Pitroda — tough, brash and determined-to-succeed in the American entrepreneurial mould — who embodies CDOT. And in a society in which success is indeed the worst crime one can commit against one's fellows, Pitroda has undoubtedly created a large number of enemies.

But Pitroda's origins, quite unremark-

able, provide few clues which reveal the secrets of his myriad successes in the US — the world's most competitive economy — and latterly in India. Born into a large 10-member Gujarati family based in a small town in Orissa where his father was a timber merchant, Pitroda is grateful for his father's single-minded aim to put his children through school and college "as he himself was just a fifth-grader." After completing his schooling from an obscure village near the small town of Anand in Gujarat, Pitroda went on to acquire a bachelors degree in physics and a masters in electronics from the well-known Baroda-based M.S. University. Although an above average student, Pitroda recalls that much of his time in college was spent in debating, dramatics and painting.

#### DECISIVE ROLE

The turning point in Pitroda's success-studded career came in 1964, when "John F. Kennedy was talking about putting man on the moon and electronics was just a nascent science and the US seemed so romantic." Encouraged by his father, who appears to have played a decisive role throughout his career, Pitroda journeyed to the US, where he was accepted by the Chicago-based Illinois Institute of Technology for a post-graduate programme in electrical engineering. The choice of Chicago, which was to become Pitroda's base for the next 20 years, was no accident. A large number of Indians, including a steady stream from M.S. University, had already found it to be a city of opportunity.

Without any financial aid ("I had \$400 when I landed in cold and dreary Chicago," he recalls) it was tough going for the young Pitroda who worked as a technician in a chemistry laboratory for four hours per day after college to finance his education. Inevitably, Pitroda earned his masters degree and enrolled for a doctoral programme, financing his education through a series of jobs — manufacturing electronic television tuners, nuclear instruments and the like. But his big break came in 1967, when he was offered employment by Automatic Electric Labs, a subsidiary of General Telephone Electronics (GTE), to work in a digital switching technology development programme.

"There were just three of us in the project team and I was the oddball in the group. We were making the first attempts in the field and I guess we were just lucky. Somehow, whatever we did turned out to be something that had not been done before," reminisces Pitroda. As a consequence, Pitroda suddenly began to acquire a reputation as well as a large number of patents in the then

barely emergent digital switching technology industry. "In my heyday at GTE, there were five lawyers busy with just filing my patents," recalls Pitroda. But his hair turned prematurely grey as well.

### COMMERCIALISATION DRIVE

In 1969, Pitroda and his group came up with their first working prototype of a skeleton digital switch. Immediately, a major commercialisation drive was launched, which led to the production of the GTE family of branch exchanges (GTD 120, 1000 and 4600) as well as the main tandem trunk exchanges (EAX-3). "This was my first flirtation with management. As senior systems manager, it was my job to introduce technology into the company's operations. One lecture course on electronic switching systems proved so popular, that I ran it at the National Electronics Conference in the US right up to 1985," says Pitroda who remains inordinately proud of his audio-visual technology shows.

Success was bound to breed complacency. By 1974, Pitroda was married, earning a princely \$240,000 per year and had a home of his own. "Every year, the company would honour me by hosting a dinner. For me, it seemed like the end of the road," recalls Pitroda. But Pitroda was nothing if not mercurial. When the GTE management commenced on a project to design digital trunk exchanges for which — without seeking Pitroda's advice — it apportioned 24 months for development, the irate Pitroda promised to deliver it in four weeks. This he duly did; but he also quit the company.

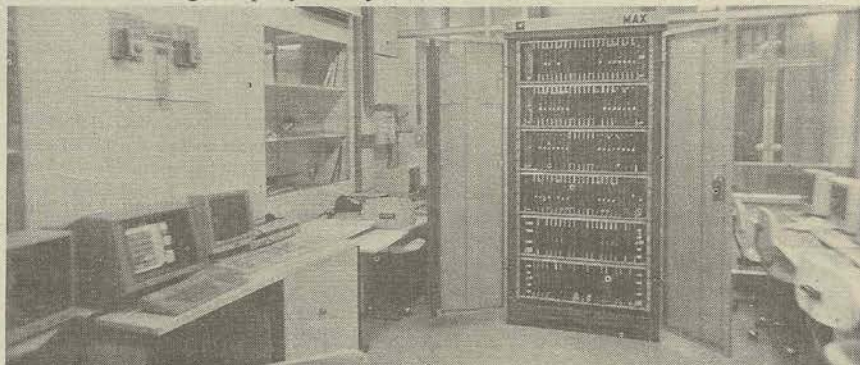
Encouraged by his entrepreneur father to go it alone, Pitroda then signed up with two Americans — Clint Penny (60) and Alan Brown (50) — to promote Wescom Inc. to manufacture switching equipment. "Now I was both owner and manager and I learnt a whole lot more as I set up the entire operation from scratch," reminisces Pitroda. The first objective of the new company was to design and produce a 2,400-line digital switching system for PABXS, which would serve as a central trunk exchange as well. "We did it and the switching system worked so well that this is one of the few products that even the mighty AT&T picked up and standardised although they had not designed it," claims Pitroda.

Such success notwithstanding, Wescom ran into heavy weather despite attaining a turnover of \$100 million by 1980. The lack of adequate resources to really make it big as well as differences of opinion between the two Americans about the future of the operations, foreclosed all but one option. And that was to sell the company — which they

did, lock, stock and barrel (Pitroda included), to Rockwell International which had been eyeing Wescom for some time. "I had invested no money in Wescom and had only a 10% share of its equity. But I was convinced that Rockwell was not doing the right thing by us, so I went looking for alternate suitors," remembers Pitroda.

### GOLD-PLATED BID

That set in motion a sequence of events which kept Wall Street on its toes for the next six months. First, it was Xerox Inc. which seemed keen on buying Wescom. Then, a Saudi-based operation which may have included Adnan Khashoggi's brother as well as a scion of the royal family, stepped into the fray. But the best bet seemed to be the computer manufacturing company Honeywell,



CDOT's MAX 512 port system in Delhi

which quickly beat a path to Pitroda's door. Quite naturally, Rockwell managers knew what was brewing and at the eleventh hour made a gold-plated bid that won the day — \$40 million (Rs. 52 crores) in cash for Wescom Inc. Part of the deal was that Pitroda would stay with the company for at least three years and would not work on digital switches in the US for another two years.

"I made about \$4 million (Rs. 5.2 crores) on the deal, of which the IRS got about 25%. As a veep (vice president) at Rockwell, with an injection of \$30 million, I helped transform it into a large company after drawing up a 10-year perspective plan for Rockwell Telecom." Pitroda at this stage in his career earned an annual salary of \$500,000 (Rs. 65 lakhs) per annum. His value to the company was confirmed by a spokesman for Rockwell Telecom, who told *International Management* (October 1985) that Pitroda was instrumental in the company developing a digital voice and data switch, which proved very profitable.

On leaving Rockwell after his mandatory three years, Pitroda's innovative drive showed no signs of flagging. In 1980, Pitroda promoted the Wisconsin-

based Micro Technologies Inc., which manufactures hybrid micro-circuits. Next he promoted Martek Inc., which produces factory automation hardware and software in Illinois. In addition, he owns Enmet Inc., a Dallas-based company which designs and manufactures electronic security systems. A fourth company manufactures playing cards designed by Pitroda (in consultation with his eight-year-old son), using binary values. "This is not work for me — it is all just a bit of fun. Whenever I promote a company, I do it in such a way that I am out of it in 90 days," he claims. It is estimated that these four companies net Pitroda a cool \$500,000 a year, which goes into a trust that has been set up for his children. "I have a large enough income from my investments," admits Pitroda.

Confronted by mid-career blues, Pitroda was at a loss. By the time he was in his late thirties, he had seen it all. A growing interest in global telecom trends led him to Brazil, where as part of a UNDP programme, he helped that country's digital switching development efforts. "I had kept in touch with India through the India Forum, started by us in Chicago in the late sixties. I had toyed with the idea of doing something for India but I was not sure what to do," admits Pitroda. In the meanwhile, he had been developing theories about what the LDCs (less developed countries) should do to catch up with the West. In 1980, Pitroda's lengthy article on the subject ("The Third Way") was published in *IEEE Spectrum*. The seeds had been planted.

### BIG CHANCE

When one of his large circle of friends sent him a newspaper clipping in May 1981 about the appointment of the H.C. Sarin Committee on telecommunications, Pitroda wrote to Sarin, who sat through a 60-minute presentation by Pitroda but characteristically never got back to him.

By this time, Pitroda was hell-bent on

catching the ears of the powers-that-be. A meeting with cabinet secretary P.C. Alexander was followed up by a crucial session with Arun Singh and Rajiv Gandhi, then the young Turk MPs of the ruling Congress (I). This finally landed him his big chance — a 30-minute audiovisual presentation to Mrs. Gandhi. And all through, it was Rajiv Gandhi who reinforced the points Pitroda was making to his mother. An alliance had been forged.

Even then, although the Union ministry of communications was asked to examine the Pitroda proposal, there was hardly a ripple. It was an open secret that the department of telecommunications (DOT), a den of hierarchy and tradition, wished to have nothing to do with what was seen as a wildcat scheme to develop contemporary telecom technology indigenously. Labelling Pitroda a maverick and/or an agent of the multinational telecom companies in the US, the mandarins of government did not have a single kind word for Pitroda — an attitude towards him which persists to this day.

But though precedent-bound bureaucrats — for whom only 'proven' (but usually obsolescent) technology is acceptable — were hostile, telecom engineers who shared his vision and faith in the high calibre of Indian technical talent were impressed. One early ally was G.B. Meemamsi (57), who is currently CDOT's executive director. While Pitroda was scorching his trail in the US, Meemamsi, a physics and mathematics graduate of Poona University who acquired a postgraduate degree in communications engineering from the Indian Institute of Sciences, Bangalore, was already on the same path. Joining the Indian Telecom Service in 1954, he was marked as a stormy petrel early in his career. By 1965, he was sent to the Telecommunications Research Centre (TRC), New Delhi, which coincided with the commissioning of the world's first electronic switching system by AT&T in the US.

#### UNHINDERED CRAWL

"I knew nothing about computers, so I slowly began to learn all about them. A small team of people — some of whom are today with CDOT — also joined me. And we began work on developing the country's first electronic switch," recalls Meemamsi. While this went on at an absolutely unhindered crawl, five years later Meemamsi was awarded a UNDP fellowship which took him to Bell Labs in the US for six months. Upon his return, the project picked up and by 1973, a 128-line analog exchange based on discrete devices — a full two generations behind — was completed, for which

Meemamsi received a Padma Shri. "It was a wonder it worked," he laughs.

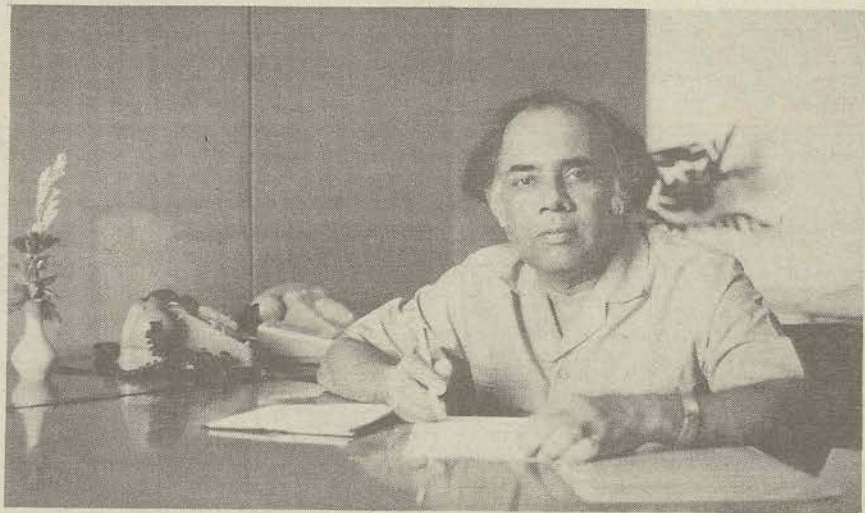
While a Rs. 1.5 crore grant was later awarded to the TRC for establishing an improved prototype in New Delhi, time was running out. Not only were telecom technologies rapidly changing, there was also no hope that DOT would ever opt to productionise this working model. The wind was already blowing in favour of large-scale imports, not only of exchanges but also of technology for the next generation of digital switching systems. Meemamsi was of course stoutly opposed to the idea: "I was convinced that we could develop digital switching systems ourselves. All that we needed to do was to import various hard-

ware modules from abroad, but develop the software and the entire architecture ourselves."

Un fortunately, DOT, which was in search of typical quick-fix solutions, was hardly interested. Against this backdrop, the enunciation of the Pitroda alternative was a heaven-sent opportunity for Meemamsi, who was quick to support it *ab initio*. "After the crucifixion, this was the resurrection," he says not without a touch of black humour.

Prodded on by instructions from on-high, a reluctant DOT finally agreed to go along with the proposal to send a four-member experts team to check out Pitroda's credentials in the US. A second visit to prepare a detailed feasibility report, and the spadework had been done. Then followed the slow grinding of the government machinery, with innumerable meetings and inter-ministerial wrangles. Only after a committee headed by Professor M.G.K. Menon endorsed the proposal to develop indigenous digital switching systems for the telecom sector, did the scheme finally receive the nod of the cabinet on 25th February 1984 — exactly three years after Pitroda had made his first pitch. "I learnt how to be patient," says Pitroda, who must have shuttled back and forth from the US at least a couple of dozen times to facilitate the opening of the Indian gates.

"The idea was to get moving fast, for we had only three years. Simultaneously, Pitke with about 10 people from his



Meemamsi: "After the crucifixion, this was the resurrection"

ware modules from abroad, but develop the software and the entire architecture ourselves."

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Around the same time, yet another lifeline to the idea was thrown by Professor M.V. Pitke (51), the respected head of the computer systems and communications group of the prestigious Tata Institute of Fundamental Research, Bombay. A doctorate from Bombay University under his belt, Pitke was part of the team which built India's first indigenous computer system. "I had got involved with digital switching technology because of a defence project. It took us about a decade to develop a rugged electronic switch for battlefield com-

group at Bangalore and I with about 15 from the TRC came aboard. Even before that, we had started working on the kind of organisation we wanted as well as the basic architecture of the system to be designed," says Meemamsi.

Nevertheless it took a full six months before CDOT came into formal existence as an autonomous, registered scientific society, patterned along the lines of the Tata Institute of Fundamental Research, and funded equally by the DOE and DOT. A three-tier management structure consisting of a governing council, a steering committee and a project board was constituted. At his own request, Pitroda was appointed advisor to CDOT on a nominal salary of Re. 1 per annum (as well as a furnished house).

If anything, the controversies that have dogged CDOT from its very genesis have intensified with each passing day. Opinion is sharply divided on the key

question of what exactly has been accomplished by CDOT in the 36 months of its mandate. Even its successes have been so twisted as to suit the various arguments that have been advanced by the different pressure groups in the country.

A cold, sober analysis however reveals that all that CDOT has been 'guilty' of is changing the rules of the game. In the words of D.R. Mahajan (56), a telecommunications engineering graduate of Poona University and a veteran of the Indian Telecom Service, who is a director on the CDOT projects board: "The first mission of CDOT was to develop, design and engineer a large digital electronic exchange suitable for Indian conditions for providing what we call POTS, i.e. plain old telephone services. On the whole, CDOT has accomplished its assigned mission not only in the prescribed time, but also with a saving of Rs. 5



Mahajan: mission accomplished

## The ESS-II controversy

To comprehend the innumerable controversies that swirl around the contemporary Indian telecom tangle, it is necessary to identify the fundamental issues involved. First of all, just how easy is it to merely access, in the broadest sense of the term, a telephone? Secondly, how reliable is the entire system? The answers are disturbing, even if obvious.

In fiscal 1985-86, there were about 3.2 million telephone connections in the country to cater to the needs of the 800 million people. With a telephone density of 0.4%, the system was nowhere near as widespread as even of other developing countries such as Brazil (2.5%), Mexico (4%), Chile (4.75%) or Uruguay (8%)—let alone the OECD nations.

Of this network, a mere 10% of the telephones were in the rural areas, so defined as to include 90% of the population. While 90% of the nation's telephones are confined to cities with populations of over 1 lakh, 65% are concentrated in just the four metros. And, the total number of public telephones, including those at post offices, were a mere 40,000. And that is just half the story.

As for the utter unreliability of this system, it has to be experienced to be believed. Poor connections, misdirected calls, poor maintenance, the lack of any standards, billing complaints, complex procedures—these are all part of a hor-

ror story that need very little reiteration. Unfortunately, not only has the priority attached to POTS (plain old telephone services) been rather low through the sixties and seventies, but also, the solutions offered have not gone beyond the mouthing of platitudes or drawing up long shopping lists of imported technology or even better, imported equipment itself.

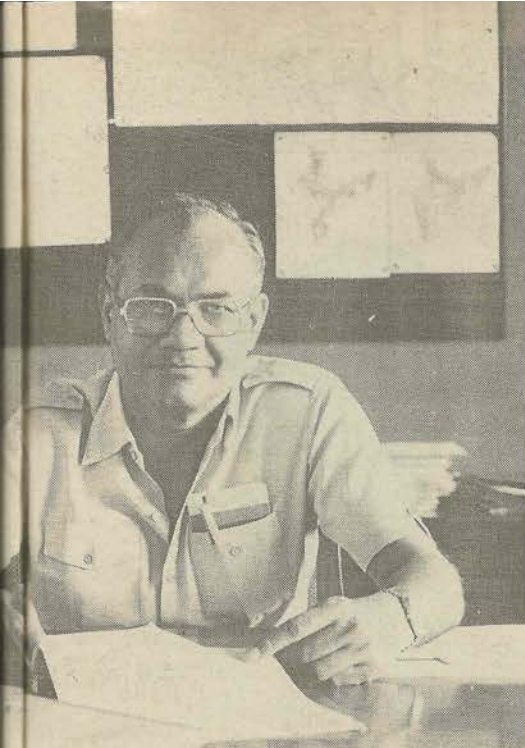
**Miserable failure.** The heart of any telecom network is the switching equipment which in the Indian context, consists of an odd mixture of strowger (1940 vintage) and pentaconta crossbar (1960) exchanges—all of which were based on western-designed systems. These were tailor-made for their own distribution patterns, that is, heavy telephone densities and low traffic per line. Naturally, faced with the demands that were made locally by a low spread and a huge number of calls per line, these systems have not been able to cope. By the early eighties, the Indian telecom system was running hard just to stay in the same place—and failing miserably.

The search for solutions began with the setting up of the H.C. Sarin Committee (1981), which manfully grappled with the innumerable problems confronting it. From a technological point of view, one outcome of this exercise was the emphasis on shifting to latter-day switching equipment—the electronic analogue and electronic digital switches. In fact, based on demand projections it was recommended that at least five electronic switching system (ESS) manufacturing factories would have to be constructed by 2000 AD, each with a capacity of

500,000 lines per annum. It was hoped that this would not only improve reliability and expand telecom coverage, but also help in replacing the older exchanges which were fast breaking down.

As it was quite evident that all over the world telephone networks were going digital, the department of telecommunications (DOT) pegged its sights on such new-wave switching systems. As no efforts had ever been made earlier to develop such switching systems indigenously, the only recourse was import of technology, with the hope that it would be a one-time import. As soon as the multinationals, which dominate the \$50 billion global telecom market, got wind of this, a battle royal raged for a piece of the action in this country.

Although there are quite a few major players in the global telecom industry, it is the "seven sisters" which have historically stayed well ahead of the field—AT&T, ITT, Siemens, Philips, Ericsson, CIT-Alcatel and STC (Standard Telephones & Cables, UK). After a considerable amount of looking around, the choice boiled down to one of four which were prepared to agree to a transfer of technology of their systems: ITT's IOC; Siemens' EWS; CIT-Alcatel's E10B and STC's TXE4. Finally, although the CIT-Alcatel technology was much older than the rest, the fact that it seemed to be a proven technology tipped the scales in its favour. Under a contract valued at about Rs. 1,350 crores, in July 1982 CIT-Alcatel signed up to supply a full range of digital exchanges as well as the basic technology to produce such exchanges in future (see cover feature BW July 22-August 4,



crores in the bargain," he says.

Mahajan's bland assurance contains a wealth of meaning, which needs to be carefully analysed. It may be recalled that within one year of its incorporation, CDOT perfected the technology of its first product — a 128 port (88-lines) EPABX system. Prompted by the DOE, which had also approved the import of technology from as many as three foreign vendors (GTE, Belgium; OKI, Japan; and Jeumont Schneider, France), CDOT employees seem to have pulled out all the stops. No less than 48 EPABX system manufacturers have opted for it as compared to the 18 who have chosen to go in for imported technology.

"The advantages are obvious — low technical knowhow fees, of just Rs. 7 lakhs; a 40% difference in per line costs because of a more rational system of production; it requires less than half the total investment usually necessary and al-

lows for a constant process of upgradation and debugging," explains Mahajan, who says that the import content in these systems has been as low as 35% from day one.

In response to persistent criticisms from industry that the CDOT-designed EPABX suffered in terms of the numerous features which the foreign manufacturers have been offering, a second version has already been sent to the DOE for evaluation, which plugs this gap. "We were selling a technology that contains all the features that we thought were necessary. If the market is enamoured of more, we just have to enhance the software," says Mahajan.

While larger versions of the CDOT-designed EPABX system can easily be developed, the second milestone crossed by CDOT has further heightened curiosity and suspicion. From July 1986, a 128 port (88-line) rural automatic exchange (RAX)

1985) within the country.

**Slow indigenisation.** By late 1985, the first ESS plant was finally ready to go on stream at Mankapur in the Gonda district of Uttar Pradesh. Set up at a cost of around Rs. 170 crores, this unit, managed by the public sector III, has yet to reach even 30% of its rated capacity of 500,000 lines per annum. Pertinently, the outgo of foreign exchange on components has also been extremely high as indigenisation has been very slow till date.

It was widely assumed that concurrent with the start of the Seventh Plan period, a second plant to produce electronic switching systems would be cleared on a priority basis. Even when the Centre for Development of Telematics (CDOT) was inaugurated in 1984 to develop appropriate indigenous telecom technology, it was clear that the indigenous technology would form the basis for ESS-III, which was slated to be cleared by August 1987, and not for ESS-II. But these hopes were dashed to the ground by the resources crunch, which led to the plan outlay of the telecom sector being slashed from the expected Rs. 12,800 crores to just Rs. 4,500 crores.

With the public sector III determined to expedite the clearance of ESS-II because of the necessity to phase out the production of its obsolete strowger and crossbar exchanges at its Bangalore plant, it had to induct a new technology to maintain its commercial viability. Moreover, the future of III's 7,000 engineers and workers also persuaded its management to convince the Union

cabinet to formally endorse the setting up of ESS-II at Bangalore in 1983, utilising CIT-Alcatel technology.

It was only after the telecom sector's plan outlay was revised to Rs. 6,000 crores, that the issue surfaced again. After a three year ding-dong battle, on 13th August 1986 the Union cabinet was once again persuaded to endorse the ESS-II project. By this time, the fact that CDOT had become spectacularly operational, prompted the argument that a decision on ESS-II, which had already been inordinately delayed thus far, ought to await the development of indigenous technology.

Even though the cabinet endorsed the choice of CIT-Alcatel technology again, CDOT pleaded for a re-evaluation on both technological and cost considerations. Rather than risk losing everything, III came up with a compromise formula — ESS-II would have a 300,000 line capacity of CIT-Alcatel technology and 200,000 lines of CDOT technology, which would take care of all the dimensions involved. But CDOT managers have argued that with CDOT technology, a 500,000 line plant would cost between Rs. 30 crores and Rs. 60 crores *cf.* Rs. 140 crores if the CIT-Alcatel technology was utilised. Moreover, on a per line basis, each CDOT line would cost Rs. 4,000 *cf.* Rs. 7,000 for the CIT-Alcatel line. Not surprisingly, even III chairman K.P.P. Nambiar is persuaded that it makes sense to wait for the development of CDOT technology.

**Political decision.** But earlier this year, CDOT officials suddenly woke up to the fact that even if CDOT technology is developed

on time, the 18-month period it would take to productionise it would create a wide demand and supply gap in the ports sector. Thus it mooted a proposal to import 200,000 lines of exchanges, once again from CIT-Alcatel. Since this proposal was also shot down, yet another scheme to induct a new technology, other than CIT-Alcatel or CDOT, has recently been put up. As this would lead to more imports of exchanges, it is clear that the decision will eventually be a political one.

For the first time, however, the political muscle is behind indigenous technology. The mandarins of DOE have been asked to come up with solutions to meet the Seventh Plan target of 2.8 million lines without recourse to imports. Such options exist. The crash expansion of ESS-I at Mankapur to ensure a progressive increase of capacity utilisation as well as an increase in production at the Rae Bareilly plant of III would suffice. For CDOT, which has got fat and bloated on a steady diet of imports, this would be a bitter pill to swallow.

At this stage of the game, CDOT appears to have a clear edge for the supply of technology for ESS-II. With the possibility of ESS-III commencing during the Seventh Plan period being remote, the onus is on CDOT to push ahead rapidly. By mid-1988, the CDOT technology must be ready to move into the production stage — which seems eminently possible. While speed is of the essence normally, this is one instance where patience could pay off handsomely.



designed by CDOT has been functioning on a real-time basis at Kittur in Karnataka. The very concept of a rural exchange, which seeks to wire up the non-urban areas which have just about 10% of the telephone lines in the country, is path-breaking. By designing an electronic telephone exchange that does not require airconditioning, can tolerate wide variations in power supply and is dustproof and tolerant of climatic extremes, the CDOT team has established its capability and competence.

As a result of this timely intervention by CDOT, the import of technology for such RAXS — which had been cleared by DOT — has now been banned. "At present, seven of the 11 units which hold letters of intent for producing these type of exchanges, have signed up for the transfer of technology. Five of them also produce PABXS, so they will need an additional investment of just Rs. 5 lakhs each to diversify into the manufacture of RAXS. I think the cost comparisons show that our technology will be at least 50% cheaper than imports on a per line basis," claims Mahajan. According to sources in DOT, the bulk production of both PABXS and RAXS will begin by December 1987 as the production infrastructure is built up. Of course, the large number of entrants in the fray is also likely to prompt the natural death of quite a few manufacturers.

#### CONSCIOUS OPTION

But one large question remains unanswered. Does CDOT, which has opted for developing smaller EPABXS and RAXS, have the competence to design the main automatic exchanges (MAX)? "The point to remember is that we are consciously opting to design a family of switching systems. As a logical consequence, the same system can be adopted for a wide variety of applications. For example, the 128 port EPABX is actually a base terminal unit module for the main exchange, which comprises about 65% of the total frame requirements for the MAX," explains K.B. Lal (43), manager (software) of CDOT. An electrical engineering graduate of Allahabad University, Lal, who spent 19 years at TRC before coming aboard CDOT, explains that by developing its PABX technology, CDOT has not only tested out but also productionised the basic MAX module.

"Based on the same logic, the next step in our development has been to try out a 512 port base module. This is the basic building block of the system and can be used as a stand-alone switch with a full complement of software which is also useful for administrative functions. This has been installed at the Delhi Cantonment exchange and has already been cut

over to the national network," explains Lal. According to Lal, the software for this single module constitutes around 90% of the total effort needed for the larger CDOT-designed exchange of 16,000 ports. This holds good for the hardware as well.

As a final step, a multi-module 16,000 ports configuration, engineered to serve about 4,000 lines, is in the process of being installed at the Ulsoor exchange in Bangalore. As Y.K. Pandey (37), manager (systems) of CDOT and another TRC alumnus, puts it, "We hope to be able to cut over this prototype by December 1987. A schedule for the field trials, which will go on for six months, is ready. And that will lead to the finalisation of the MAX production model." According to a recent top-level evaluation of CDOT by an inter-ministerial group, the CDOT



Pandey: field trials schedule



Lal: a family of switching systems

main automatic exchange will be ready for production in early 1988.

Inevitably, there is no dearth of cynics who question these fundamental projections. According to proponents of this school of thought, the successful working of the 512 port base module does not by itself guarantee the success of the main 16,000-line exchange, which uses 32 such base modules and a central module for inter-connection. As a top-level telecom bureaucrat puts it, "In fact, the real problems will arise only at that stage. The software bugs will surface only after the integration takes place."

CDOT engineers concede this, but argue that the basic system they have designed is guaranteed to minimise potential problems all along the way. "There may and will be bugs. But the point is, we know how to move in and iron them out as speedily as possible. This happens even when a tried and tested system is

linked to a particular network. If it happens to be an imported switching system, we have to go running back to the foreign supplier, which leads to more delays. In the case of CDOT technology these delays will be under control," says Lal.

Strictly speaking, however, CDOT is not running according to schedule. It is running at least four months late in commissioning the 16,000 port exchange it was asked to design. As against this, it needs to be borne in mind that CDOT has come up with two by-products, i.e. EPABXS and RAXS, which have saved a hefty outflow of foreign exchange. At the same time, the dynamic role that CDOT has played in simultaneously developing the telecom ancillary industry from the very outset, cannot be easily dismissed. It is estimated that as a result of this emphasis, as much as 60% of the cost of the CDOT family of products, including the MAX, can be indigenised by 1988-89. With a

production philosophy that stresses labour-intensive as well as capital-sensitive processes, as is exemplified by the pilot plant which has already been set up, the backward and forward linkages of the CDOT technology are already in place.

As the blowing over of the controversies regarding the second electronic switching systems (ESS) plant indicates (see box p.36), the main problem appears to be a deep-seated distrust of CDOT. "The argument about imports to bridge the gap or to use a combination of foreign and CDOT technologies is begging the point. Why was CDOT set up after all?" asks a top-ranking bureaucrat.

Indeed, this is a point that appears to have been missed by many. From the very beginning, the argument for developing switching technology was not self-reliance *per se*, for that was akin to reinventing the wheel. The real argument for CDOT was that most western telephone networks are characterised by a high density of telephone connections and low traffic per connection, while the Indian situation is the exact reverse. A technology developed for the first situation, as the Indian experience indicates, does not work in the second.

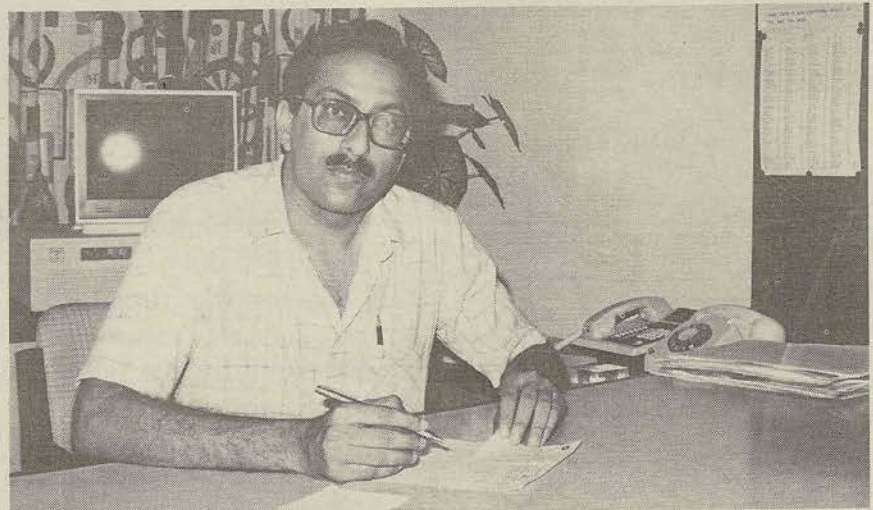
#### EXCELLENT WORK

As even the pick of the world's telecom experts — who have made the journey to the CDOT headquarters in (formerly) Akbar Hotel, New Delhi, as cynics and returned as converts — admit, the CDOT technology is an excellent piece of work. Tailormade to tackle several typically Indian problems (see box p.36), it is also likely to be relatively inexpensive to productionise. As against the cost of over Rs. 170 crores incurred by IIT for setting up the first 500,000-line electronic switching systems plant at Mankapur in Uttar Pradesh using CIT-Alcatel technology, CDOT sources insist that the preliminary estimate for setting up a production plant of similar size using CDOT technology would be only Rs. 30 crores! While this may be an exaggeration, even a liberal estimate pegs it at around Rs. 100 crores. Quite clearly, it is worth waiting for CDOT, and even the most die-hard sceptics are slowly veering round to this point of view.

CDOT's most amazing achievement is that it has come so far when the rest of the world has spent three times the time and 10 times the money in developing similar products. "This has never been a technical challenge — only a managerial one," says Pitroda, who is a devout adherent of the concept of MBO (management by objectives). In keeping with the way he plans his personal routine, in a meticulously updated diary, Pitroda is

given the credit for providing for every eventuality at CDOT. As one engineer points out, "He has done this sort of thing before, so there was a tremendous amount of anticipation of problems, which helped a lot."

Rather than taking the natural option of hiring experienced researchers, it was Pitroda's idea to recruit enthusiastic youngsters straight out of institutions of higher learning. "Their mind-set is easy to adapt and they are easier to motivate as they have not been exposed to the system," he says. Consequently, the average age of the 475 employees at CDOT is an astonishing 25 years. To ensure that the best talent was recruited, a package of benefits (including housing and transport facilities) which matched that of a typical organised private sector firm, was provided to most CDOT employees.



Abrol: recognition of the contribution of every function

As Dr. Sunil Abrol (36) — a specialist in human behaviour and industrial psychology, who serves as the all-important registrar of CDOT — points out, "The organisational culture in an R&D mission has to be a departure from the norm. Usually the technical functions are given greater importance while the support functions are ignored. We have taken care to recognise the contribution of every function to minimise antagonism and apathy, which usually result in delays." Refreshingly in CDOT, there is a clear delineation of team responsibilities, and time frames based on a familiar PERT (program evaluation and review techniques) system are aided by CPA (critical path analysis) for each major and minor activity.

#### EGALITARIAN PRACTICES

"There is a great deal of flexibility built into CDOT's management style. One

can work when one wants, day or night; only the minimal paperwork is encouraged and we don't have complicated rules about travel allowances as everybody travels by air. There are no formal designations below the manager or group leader level. We really practice egalitarianism. When we meet for reviews, everybody, and that means all support staff, is included. The results are there to see," says Abrol proudly. Another unusual practice in the Indian context is the emphasis on setting group rather than individual targets, which has contributed to building teams within the centre.

Reflecting Pitroda's US experience, there is a tremendous amount of 'hoopla' in CDOT. Wall posters, cartoons and a fairly witty in-house magazine serve in helping CDOT employees to highlight in

an irreverent fashion the deadly serious nature of the task at hand. For the youthful employees (except for the perpetually harried support staff), working in CDOT appears to be a lot of fun. And part of the fun is that the goods are also being delivered. Recently, for example, a whole week of lunches, games and music was organised to celebrate the end of the first 36-month mission of CDOT. The influence of Pitroda, who walks around with the constant refrain of "You guys are doing a tremendous job," is unmistakable.

But though the imminent success of CDOT is likely to spawn a large number of sectoral research clones, a mere divorce from the tight embrace of governmental and bureaucratic interference is only half the battle won. As one of Pitroda's favourite sayings goes, "People don't want to be managed. They want to be led." Only time will tell if the CDOT experiment has created enough such leaders.

## "It has been the best experience of my life"

*Although he would be the first to deny it, Satyen ('Sam') Pitroda (44), the prime mover behind the Centre for Development of Telematics (CDOT), is a force to reckon with in the corridors of power in New Delhi. As the advisor to CDOT, Pitroda puts in a torrid 12-hour working day (8 am to 8 pm), not all of which is devoted to CDOT. Pitroda spoke to BW in his ninth floor headquarters of what was formerly the Akbar Hotel. Excerpts from the conversation.*

### ■ On the decision to return to India.

I was part of the brain drain from here. So in the early eighties, I thought, let me be part of the brain gain. I had always wanted to do something for this country but I wasn't quite sure what to do. Then came this chance and this is the challenge of my life. It hasn't been easy — I have had to leave behind the last two decades of my life. I have given up my American citizenship and the transition has been painful, particularly for the kids. But this is, after all, a fantastic opportunity, and I've made my choice. This is a social commitment, not a business one.

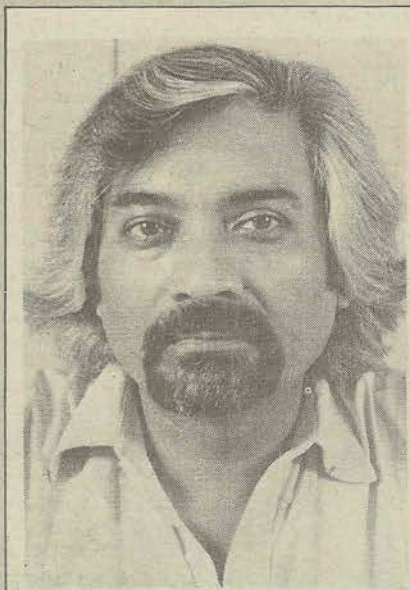
### ■ On his years in the us.

After getting my masters degree from Baroda, my elder brother and I had both planned to go to the us. Ultimately, I went to Chicago where I got my masters degree in electrical engineering. After that, I got my big break when I joined up with GTE to work in the then brand new field of developing digital switching technology in 1966. The timing was perfect — whatever we did was turning out to be something new in the field. GTE did a lot for me — they encouraged me, were proud of me.

But I had always wanted to go it alone and by 1974, I was ready to do so. In partnership with two friends, we set up Wescom Inc. to manufacture digital switches. That's where I learnt management and picked up a different perception altogether. Finally, we sold Wescom to Rockwell for about \$40 million and I had made my pile. In the meantime, the whole family had moved over to the us. We have returned home without anybody being here.

### ■ On the events leading up to the formation of CDOT.

It was again a question of timing. I had made it in the us, was still in my late



**"In the ultimate analysis, there are only two kinds of people — those who are for self-reliance and those who are against self-reliance. I think CDOT has made its point"**

thirties, and the support of my family was strong. I had kept in touch with the country to some extent and knew a lot of people — scientists, social scientists, old friends. Telecom development in the third world was beginning to fascinate me — I had written and thought about it.

Then I learnt about the setting up of the Sarin Committee and you know the rest. I had first met Meemamsi in Tokyo in 1976 at a telecom conference, and Pitke in Munich at about the same time. So, things clicked and the mood in the country was also just right.

### ■ On his confidence that CDOT would deliver the goods in 36 months at a cost of Rs. 36 crores only.

There were two sets of reasons. I have believed for a very long time that we have a tremendous amount of scientific talent in this country. These guys are as smart and capable as you can find any-

where in the world. The only problem is to motivate them — give them a goal, provide the right environment for them to work in and then let them get on with what has to be done. The problem has never been a technological one — it was always a managerial challenge.

As for the costs, well, there are obvious reasons for this. We were starting off in 1985 and so we were in a position to take advantage of all the advances in technology that had occurred over the years. And this is a universal truth — in the nineties, you can design a switching system more cheaply than in the eighties. Above all, don't forget the employee costs which are tremendously expensive overseas. More than 75% of the cost of a typical switching system bought from the multinationals relates to such labour costs. Naturally, we can do it far cheaper.

### ■ On how close CDOT is to achieving its objectives.

We have already come up with the EPABX and RAX technologies, to which the response has been terrific. I am really sold on rural telecom as a key to development. We have to focus on this vital area as also a public telephone system. As for the MAX, the base module will be cut over at Delhi Cantonment and then we go on to Ulsoor where the MAX will be installed by the year-end. What is a delay of four months in a 36-month project? In the ultimate analysis, there are only two kinds of people — those who are for self-reliance and those who are against self-reliance. I think CDOT has made its point. Now it is time to move on to bigger and better things.

### ■ On his managerial style.

I somehow don't think I am a good manager. A good strategist, yes. I can visualise things fairly well and then translate them into reality. But it has never bothered me as to who gets the credit. I am a people's man — I believe in intense interaction with people. Formal interaction to get things going and informal for my own inputs. I also believe in loading people with responsibilities — find the right people, back them up to the hilt and don't ask too many questions. Always overtrust your people — it gets you the best results.

### ■ On what has been the recipe for the success of CDOT.

Indian society is extremely hierarchical, which breeds inefficiency and corruption. So the first thing we decided was to take on youngsters, fresh from university. We gave them what they wanted in terms of material benefits because that was hardly the key question. Then, each one was given specific tasks to perform within a group. One can never achieve anything unless teams are built. I am also a believer in open communication. In CDOT there are no hierarchies, no secrets.

Then we have periodic reviews — once a month where we meet everybody. This gives us an idea of where we stand as well as a sense of belonging and accomplishment. The idea is to always ensure that there is total clarity about goals. If there is a confusion about goals, there are problems.

■ **On the problems ahead in CDOT.**

There may be problems; in fact, there should be. But we will solve them. That is precisely the capability that we have built up here. Now we have started working on our second telecom mission for CDOT. We will broaden the CDOT family of exchanges, ensure the transfer of technology and productionisation of our MAX technology. We will also establish a CDOT campus and start working on the integrated systems digital network for the future. I think there will be sufficient scope for all our youngsters to remain motivated within the ambit of all these activities.

■ **On his increasing involvement with non-CDOT activities.**

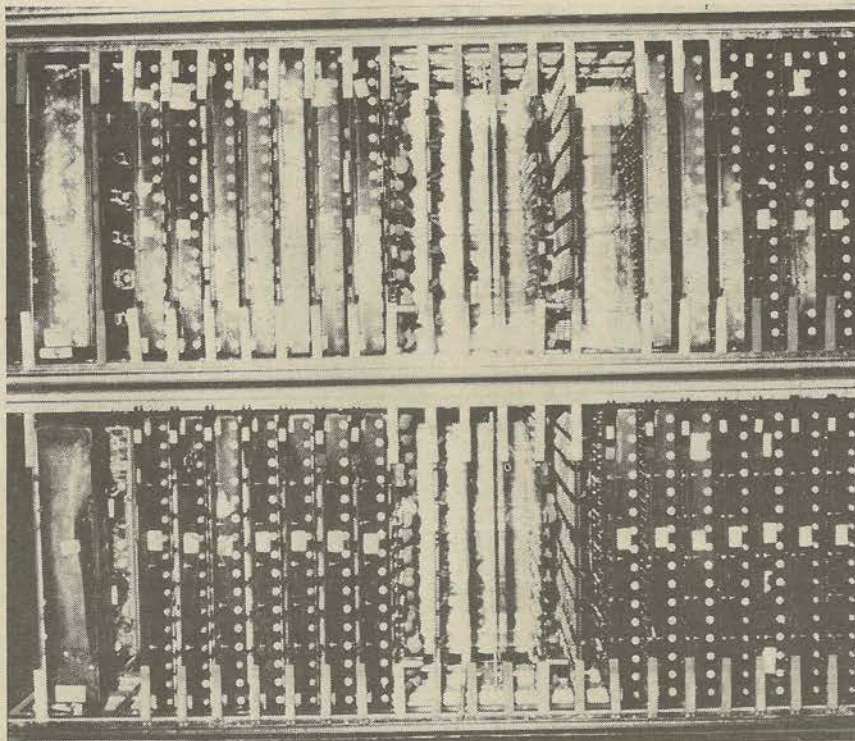
I am only doing what any other concerned citizen would.

■ **On his personal view of the CDOT experience.**

Fantastic. It has been the best experience of my life.

■ **On the importance of the telecom sector.**

It should be a national priority. We are just beginning to recognise the real benefits of improved telecommunications. While telecom is capital-intensive, in the sense that large outlays are necessary, it is also job-intensive. Telecom development benefits everybody — industry, business, government, defence. I think that government attitudes towards the telecom industry have changed for the first time. This is a positive sign although much more needs to be done.



CDOT-designed rural automatic exchange: persona threat

Paradoxically, though Pitroda is clearly responsible for conjuring up CDOT and injecting into it a cheerful can-do culture which indigenous R&D organisations so conspicuously lack, his persona is also emerging as its single biggest threat. A prominent member of the back-room group which advises prime minister Rajiv Gandhi, Pitroda is the butt of much criticism for enjoying a status disproportionate to his authority. As is common knowledge, it was Pitroda who advised the prime minister to set up five technology missions. Once again, it was he who drew up a plan for the reorganisation of the Congress (I) to make it a cadre-based party. Again, it is widely believed that it was Pitroda who organised the recent festival of science in the Soviet Union simply because in his opinion, the previous one in the US was not up to the mark.

Moreover, on diverse subjects such as celebrating the 40th anniversary of Independence or the setting up of a think-tank of intellectuals to brief the prime minister, Pitroda's diminutive figure looms large within the circle of courtiers who are attracting widespread criticism for tendering "erroneous advice" to the deep-in-trouble prime minister.

**CONCERNED CITIZEN**

"I am only doing what any concerned citizen would," is all that Pitroda offers

by way of explanation. Unfortunately, this is an explanation which has worn thin, given the obviousness with which the plethora of 'concerned citizens' who have flocked around Rajiv Gandhi have helped themselves rather than the nation.

While Pitroda — a dollar millionaire in his own right — is above suspicion of financial wheeling-dealing, the authority which he commands and which has helped CDOT get off to a fine start, may well boomerang on him. A trespass of their lucrative fishing grounds is a crime which the nation's tribe of percentage politicians cannot tolerate. Especially if the trespassers are individuals of proven competence.

Thus despite CDOT owing much of its dream debut to the restless imagination of Pitroda, at this stage the centre cannot afford to have its fortunes linked with those of Pitroda or even those of prime minister Rajiv Gandhi. Out of the chaos of contemporary politics it has emerged as a unique institution capable of serving as a role model for other applied research institutions and capable of putting the nation's skilled engineers to productive use. Given its track record thus far, the chances are that CDOT will succeed. But in an environment of heightened political tensions, the moment has come for Sam Pitroda to once again make a choice — between industry and politics. ☐