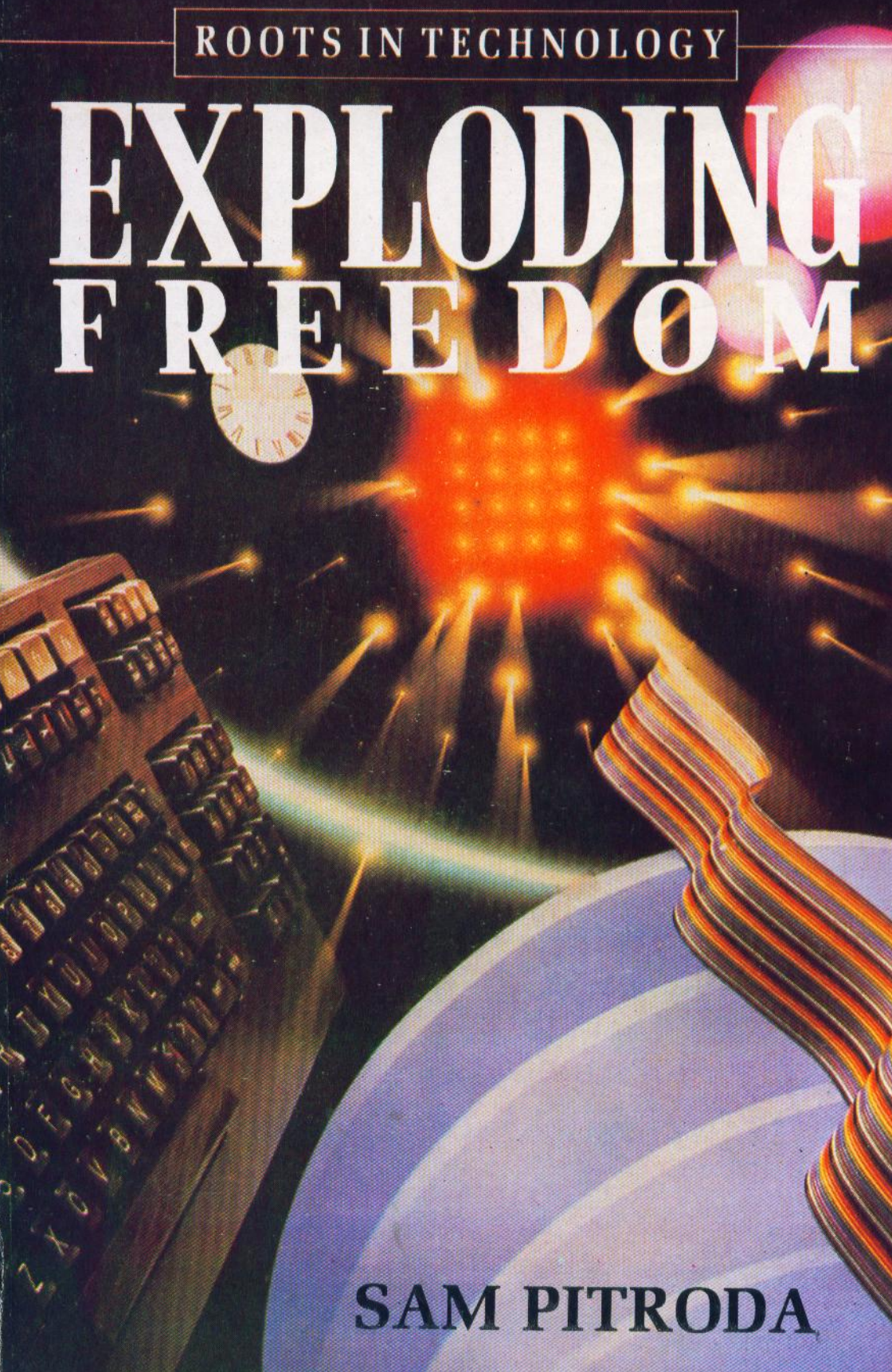
ROOTS IN TECHNOLOGY

EXPLODING FREEDOM



SAM PITRODA

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With affection &
admiration
Narayanan
19/4/93.

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Prarthna Flats (1st Floor), Navrangpura, Ahmedabad 380009
3-5-1114/1 Kachiguda Cross Road, Hyderabad 500027
60 Bajaj Nagar, Central Bazar Road, Nagpur 440010
16A Ashok Marg, Patiala House, Lucknow 226001
5th Main Road, Gandhinagar, Bangalore 560009
17 Chittaranjan Avenue, Calcutta 700072
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To
My parents
for lots of love
and
encouragement to explore new frontiers

Contents

Preface

Even with the advantages of hindsight, the changes in the Soviet Union and Eastern Europe seem phantasmagoric. They took place unanticipated, and continue to baffle the world for their sheer unpredictability.

I must admit to a sense of perverse glee at the way the political sages failed so monumentally to anticipate the changes. No matter what political and social analysts now say, the fact is that none of them had a clue about the impending revolution. It is pointless wondering why we failed to see it coming. The next best thing to do is to try and analyse it. That is precisely what I have attempted.

I am convinced that technology was at the core of this change. Technology triggered the explosion in freedom. It will dominate the world in the next 50 years. You may ask what I base this on. I base it on my personal entrepreneurial background in technology in the United States for over two decades and in my position as an Adviser to the Prime Minister of India, at the time of Rajiv Gandhi, and watching and meeting several world leaders including Mr Gorbachov.

This book does reach a few conclusions.

- ★ Perestroika would not have happened without modern information/communication systems and associated implications of openness, accountability, connectivity, accessibility and networking.
- ★ The explosion of freedom and the spread of democracy (far beyond the USSR) would have been deferred or delayed had it not been for the marvel of mass communication techniques. Technology in this instance goes beyond being a mere catalyst. More than speeding up the process of democracy, it strengthened it by involving such a large number of people that it became impossible for the established order to survive.
- ★ The technology of the Atom Bomb was the instrument which metamorphosed the old order by breaking it up and dividing the world into capitalist and socialist ideologies.
- ★ The proponents of the Socialist system have finally realised that only the spread of free market economy, through entrepreneurial drive and individual initiative, can develop the distribution and delivery systems necessary to meet growing consumer aspirations and economic prosperity.
- ★ The re-alignment of Eastern Europe and the Soviet Union was needed. The old ideologies had less and less relevance as the 90s approached. Instead, markets and technologies have become the dominating forces because of the globalisation of economies and a new partnership which affects pro-

ducts and planning.

- ★ The restructuring resulting from the recent new awakening in Europe represents a monumental challenge for a change. It will put tremendous demands on the advanced countries of the West in terms of technology, management and financial resources. The nature of that pressure will be analysed later.
- ★ The immediate consequences of all this change will be that the 'White Christian World', will unite as never before, having rid itself of the barriers of ideology. 'The Coloured World' or 'The Mosaic World', as we call it, will be marginalised or at best become a weak counterforce to the northern, White Christian World. The world will be North-South in power terms and no longer East-West.
- ★ Politics, as popularly understood, will take the back seat. Technology will be at the wheel. Technocrats will take precedence over politicians. Somewhere along the line the two will merge. Technology will be the most sought after weapon. Those who have it will have a piece of the world cake. Those who don't will struggle to acquire it.
- ★ Environmental concerns will be the only meeting ground between the powerful and the weak. That sense of survival will play a crucial role in reuniting the world.
- ★ Developing nations will no longer be entertained on the ground of compassion. They will have to struggle even harder to get their share of the world's resources.
- ★ The North-South phase could last up to 50 years to be eventually followed by another realignment and a move towards a world government in the next 100 years.

In my personal advancement, technology gave me the tools to fight poverty, cut across caste and community barriers and bring pride in performance. Technology was helpful in not only generating personal wealth but also generating ideas and exploring new concepts related to products, services, markets, growth, developments, values and work. Technology taught me a great deal of discipline, good interpersonal relations, team work, management and a systematic approach to problem-solving with focus on clear objectives, measurable milestones and commitment to reach fruition. During the initial period after I went to the US, I used to find technology and standards in everything from revolving glass doors to fighting cold in a windy city to tea bags. Lots of technologies were alien and intimidating at first. After a while, new technology became part of the new culture.

In the sixties a fascination for technology developed in the minds of many young people like myself, who were highly charged with a call to take man to the moon. It was a dream to be translated with modern technology in the near future. American developments were then symbolized by this call to engineers and scientists working at the universities, laboratories and large companies to face this challenge and make it a reality.

In the seventies America was at work, full of innovations, experiments and excitement. It was indeed a technology driven society which was committed to delivering the fruits of democracy to millions. There were ample opportunities for all with a larger market for many consumables. America has always been a big melting pot where all peoples from the world over come to explore new frontiers. Even after 200 years it still remains a dreamland for many — as a dynamic, aggressive and technology driven society. In the Western world, technology has forced a certain human discipline, values, standards and in the process created respect for work. It has also helped level out the society to bridge the gap between the rich and the poor and create a very large middle class living in comfort. This does not mean that there are no social problems related to technology and its application. Along with these material benefits technology has also created individuals with ability to get things done.

While commuting from Chicago and reflecting at O'Hare airport I used to have this fear that in the next 24 hours I would be landing in a totally different world with different values, different work ethics and different standards. Landing at Delhi airport in India was a different experience altogether. Loads of people waiting, stepping over each other, long lines at Customs, delays in the baggage clearance and confusion were always a hallmark when stepping into a developing system. What I had left in Chicago 24 hours back was so very different from the one in front of me—complex, bureaucratic, feudal and hierarchical. In my judgment it was in dire need of technology for modernization. But then technology was not the ultimate answer—it was only an entry point to begin to look at systems and solutions differently. Technology was needed not only to organize, simplify and create jobs and increase productivity but also to eliminate poverty and create new work environments to meet basic human needs. I saw so much potential for technology for problem solving and so much to do that I always found myself drowning in ideas and excitement.

However, I realised that this excitement had a lot to do with the new performance oriented culture I had acquired. As a result of living in the US for the most productive part of my life, my values and perceptions had changed beyond recognition. What was right and wrong, proper and not very proper, fair and unfair, good and bad, acceptable and not very acceptable, clean and not very clean was very different in India than in the US. Here it appeared that many things were politicized and bureaucratized. These include products, processes, procedures, planning, performance and even prices. Every major decision and activity had a political overtone. Without political commitment, accomplishment was difficult if not impossible here. The traditions and emotions were so strong that they affected objective analysis and action at home and at work.

This contrast between Indian tradition and Western technology always used to stare me in the face. Deep down inside I felt that there were better ways to use the same level of technology for different sets of challenges in a developing society. Technology was something one could not write off and quickly disregard and conclude that it is not needed. Technology could not be alienated and

isolated in this complex and confused environment. These thoughts about social utility and impact of technology in India and the US kept my mind occupied for most of the time. When I came to Delhi I did not know anyone. I landed at the airport and looked for a hotel. Having found the Taj Mahal Hotel I used to hang around for days to establish contacts and connections to continue commuting. Through perseverance and a bit of luck I met important and open-minded Government officers and finally Mrs. Indira Gandhi, then Prime Minister, for an hour long slide presentation on the role of telecom development in India. This gave me an entry into the system with an introduction to Rajiv Gandhi who became Prime Minister in late 1984 after his mother's assassination. With this unique opportunity to contribute the needed commitment and with the political support in the country, I finally got tired of commuting and decided to move back after 22 years in the US, with my wife and two children.

In between I used to travel to Tianjin, China, just about the time when the new national programme for modernization was launched for progress into the next decade. This programme was totally different from the past practices. It was designed to invite foreign investment and technology for free markets, tourism, modernization of plant and machinery and export potential. In this process many luxury hotels were built to accommodate foreign visitors and introduce them to a system which was closed for over 40 years. Signals were clear that the Chinese had recognized the role of modern technology and were looking forward for increased foreign trade, for which they were prepared to break traditions.

In 1987, I had the first opportunity to visit Moscow. It was a strange feeling for someone who had lived in America for 22 years and had been listening to a lot of propaganda about Communism and the other Superpower. A strange environment was apparent in Moscow with long queues of people looking for products and comparatively little service or smile at a hotel. For me it was a surprise to learn that there were no telephone directories and the Russian citizens could not enter hotels strictly reserved only for foreigners. Eating out at restaurants without proper official contact was an ordeal. The dollar was valued as a precious commodity and open black markets were visible at all hotel corners. For a mighty power with a strong military base this was a strange situation. There were many procedures and forms to get anything done. Their bureaucracy was visible even at the departmental stores. Freedom to travel was restricted and freedom of speech was also restricted. This was a major contrast between the life-style in the free Western world and the one I saw at Moscow. However, the people I interacted with were as human as I found in America—warm, friendly, eager and enthusiastic. Though they were afraid to take you to their homes and interact freely in public, they were eager to establish contacts and know more about your world, views, products, plans etc. During my first trip to the USSR I could sense a need for massive reforms.

The Soviets have a rich cultural heritage and a lot of potential technologies. But the peoples' energies and aspirations have been bottled up for decades.

They were now exposed to others through TV and tourists and were bubbling with expectations and hopes for new directions. They had taken care of the basic needs and were ready to take the next steps towards democratization and economic reform. During my frequent visits thereafter I saw significant changes. They were receptive to new ideas and social innovation. Open markets were appearing, with independent entrepreneurs on the streets. More friendly cafes were mushrooming and painters, on the pavements selling abstract art, were signs of the coming new wave. Mikhail Gorbachov was already firmly in power. His initiatives were apparent and visible everywhere.

By this time, I had established a strong foothold in India. As an adviser to Prime Minister Rajiv Gandhi I was involved in major, national programmes on technology relating to rural drinking water, immunisation, adult literacy, oilseeds, telecom and dairy production development. This had given me a broad canvas on which to display technology and related activities. These were massive social programmes, and technology was needed to bring about changes in awareness and attitude in many critical areas. Working on these challenges taught me a great deal about Indian systems, administration, attitudes, constraints, and capabilities. This experience reinforced my faith in technology as an agent of change. Being close to the centre of power, I was able to see and experience the dynamics of decision-making and national development.

I have had an opportunity to meet many intellectuals, scientists, opinion-makers and world leaders including Gorbachov. I discussed with him the fact that his Perestroika had roots in communication and information technology based on openness and accountability. As in the media, in person he generated a lot of confidence with an air around him—full of leadership and enthusiasm. These and many other contacts with key decision makers helped crystallize my views on the role of technology in the processes of democratization and development. Every world leader I met was interested in either selling technology or buying technology.

In discussion in Brussels with EEC officials, a strong emphasis on market alliances was very apparent everywhere. The EEC will clearly create a borderless system amongst its 12 member states and beyond to share technology, markets and resources. This will create a new cartel as powerful as the US in the form of a unified Europe, requiring a focus on technology, standards, interfaces and a common work culture. Over the years during my frequent visits to Singapore I saw the total transformation from a traditional 'Chinatown' to a glass city of modern skyscrapers, shopping centres, luxury hotels and fast food chains. The winds of change and benefits of new technology had already travelled all the way to the Asia-Pacific region and invaded many other countries in the area such as Korea, Hong Kong, Taiwan and Thailand. Japan, with technology in the forefront, has dominated the world economy. There are many lessons to be learnt from these small countries in the Asia-Pacific region about technology transfer, business development, free enterprise and social transformation. There are also many dangers to watch for in their pattern of development which has

been predominantly based on the American market system and American know-how.

Against the backdrop of these unique experiences I have slowly but surely, crystallized my observations, analysis, and feelings about the role of technology and information systems. Once I started to integrate a decade of dialogue in my mind it was apparent that the human energies bottled up in the past had to be released for everyone to have an opportunity to experiment, explore, excel and export. Democracy was the key to exercising individual initiative to create a free world for free expression, free enterprise and new alliances. The traditional hierarchical system of bureaucracy and vested interests needed to be taken under control to create more equality, opportunities and understanding. The boundaries had to melt away if free trade was to flow. Technology and information are the keys.

The initiative Gorbachov took through Perestroika provided the momentum needed to streamroll new alliances. Events in Eastern Europe, in particular the upheaval in Romania and the bloodbath in Tiananmen Square in Beijing, are evidence enough of the world being restructured. Like many others, I also saw a new scenario unfolding to prepare the world for the next century. I wanted to make sure that during this phase of restructuring people anywhere appreciated and understood the role of technology in democratization, communication and information systems to network people and ideas. As bullets were being fired in Romania I made my decision to make to attempt to express in a book all that I had experienced and questioned over a decade, on the subject of technology, democratization, and explosion in freedom.

This book is a limited vision, through as it were, a pair of technology glasses. Technology is my background and discipline. I view things accordingly. If a social scientist can emphasise social science, class conflicts, civic sense, social behaviour and needs, and an economist can emphasise resource allocation, development planning, balance of payments, then I may be forgiven as a technocrat for emphasising the role of technology in the processes of democratization.

In general, I find that those who are on the 'Left' believe in public participation and action, state controls, centralised planning, and subsidising development programmes as ways to achieve the larger social objectives. On the other hand, those who are on the 'Right' emphasise free enterprise, market dynamics and individual initiative. People on the Left believe more in equitable distribution and those on the Right believe more in performance and competition. However, these traditional divisions and views are changing rapidly. Left and Right are now merging to a point 'up North', for everyone to aim at and move to. As a technocrat, I have tried to be as rational as possible and as objective as feasible in my approach and analysis. However, my built-in bias prevents me from being anything but what I am—the product of my technological and managerial experience.

I thank all those who have helped me in bringing out this book. While it

would not be possible to mention all of them, I would particularly like to thank Sunil, Sujata and Janardhan for typing the manuscript from dictation, Dr. J. Bhagyalakshmi for editing the manuscript, Dolly and Mani for incorporating the correction in the Computer, Avinash for giving the final shape by using desk-top publishing, Ajmer Pratap Singh for the cover design and Mr. D. Krishna Rao for coordinating and seeing the manuscript through press.

1. Introduction

Technology stands second only to death as the greatest leveller in society. It razes social barriers. It eliminates elitism. It puts two socially, culturally, intellectually and economically unequal human beings on an equal footing. Technology is the most potent tool to democratise the world. The bedrock of this book is that it is endlessly fascinating to observe that our world is full of the triumphs of technology.

This book is about the call for democracy and the role of technology and information systems in the process of democratization. It is about the potential for freedom, flexibility and opportunities for millions who have been isolated and alienated from the fruits of all the pervasive, technological development and products. It is about choice, between bread and the bullet, between machine-guns and ploughshares, cooperation and confrontation, openness and secrecy. It is about the belief that we can all hope to create a new world order for lasting peace and prosperity.

This book is not an academic reference tome, nor does it try to shroud essentially simple facts in abstract concepts. It attempts to analyse and simplify first-hand experiences and personal impressions about technology and its relationship with the restructuring taking place around the world. The startlingly swift change in the socialist countries and their craving for democracy, a free market economy and an end to patronage and the privilege of the establishment can be cited as evidence.

Change in Eastern Europe has its roots in the impact of technology. Perestroika, for instance, could not have happened without modern information systems and the associated implications for openness, accountability, connectivity and accessibility. It can be said, with little risk of contradiction, that the spread of democracy would have been deferred or delayed had it not been for the marvel of mass communication techniques. Technology, in this instance, went beyond being a mere catalyst. Not only did it speed up the process of democratization, it strengthened it by involving such a large number of people that it became impossible for the established order to survive. This spread of democracy is a part of the process of forging new alliances for the next century, and the latter is bound to be even more technologically-driven than the present. We need to understand the dynamics of this new direction towards democratization and the resulting technological and market opportunities it represents.

The first 22 years of my life were spent in India. The next 22 in America. Naturally, I have synthesised eastern traditions and western attitudes towards them. I understand the conflict between eastern traditions and western technology and the tension created in the transformation from tradition to technology. That gave me a key to understand what was happening in China and the USSR during my numerous visits to both countries.

I sold my high-technology telecom manufacturing company and achieved the American dream of making my pot of gold. I had finally earned the financial freedom which I had always dreamt of.

My active role in the US telecom revolution made certain deep impressions on my mind about the role of information technology in promoting openness, accessibility, accountability, productivity and efficiency. I was convinced that telecoms and modern information systems were critical to overall national development and democratization. Without good information systems and associated communication networks it is not feasible to build a modern nation with freedom, flexibility and equality of opportunities for all.

I went to the US to learn and stayed to earn. Later, I felt it was about time to return to India to try another American dream—exploring new frontiers. I wanted to come back to my birthplace, and use technology help create an infrastructure for modern communication systems. My Chicago-Delhi commuting years gave me long hours on the plane to think about the impact of technology on my personal growth and US society. The child, who travelled only in bullock carts and never even had an opportunity to use a telephone before leaving for the US or see a plane from nearby, became an adult who was only too aware that commuting 10,000 miles from the US to India to explore new challenges was possible only through the benefits of technology.

I have used three watersheds in modern history as my framework for the book. The first one deals with World War II and the resulting world divided by ideologies, walls and varying values. It also deals with the role of technology and information systems in social transformation and democratic norms. The second begins with Mikhail Gorbachov's Perestroika, the associated explosion of freedom, new alliances and the globalization of technology and trade. And the third deals with the monumental challenges that are needed to make Perestroika survive and its significance for developing countries. The book ends with a description of the future world which is now in the making.

The start of World War II was to some extent the start of the end of monarchy, aristocracy, domination, exploitation and feudalism.

The atomic bombs dropped on Hiroshima and Nagasaki in Japan may have brought the second World War to an end, but they also gave rise to political conflicts and the Cold War between the two great powers. Little was known then that there would be the powerful technology of information which would concrete people to initiate a process which would eventually break those very walls.

Simultaneously, there was a massive movement going on in India and other

British colonies, led by Mahatma Gandhi and his philosophy of non-violence. The Indian freedom struggle was designed to end the British Raj all over the world and it produced a chain reaction in Asia and Africa. In the process, the world saw democracy and dictatorship flourish simultaneously. Many countries with old traditions were given new freedom and administrative responsibilities to guide their own destiny.

World War II caused enormous pain. Millions died and more suffered. There was starvation during the siege of Leningrad, the holocaust, and millions of families were divided in Europe. The horrors of Hiroshima remain difficult to erase. In spite of all this, the world had to get back to work. The task of rebuilding Germany and Japan was monumental. Getting back to work meant mobilizing technology to rebuild a basic industrial infrastructure and create new jobs from among the ruins.

World War II was a classic example of the evil side of technology. What it did to the world should have been enough to put man permanently off technology and its powers of awesome destruction.

But as the world rummaged through the ruins left by the war it began to find technology as a mitigator first and then as a tool of equally awesome construction. The world could be rebuilt from the ruins of the two wars largely due to technology.

Basic human needs such as food, health, education, shelter, transport and communication are increasingly becoming technology related. In the last 50 years many technological innovations have radicalised our life-styles. From the bullock-drawn cart to supersonic jets, everything is an onward march of technology.

Many of the innovations came from small entrepreneurs and individuals as opposed to large multinationals which have massive expenditure on research and development in the US and Europe. This started a new process of democratising technology and as a result, new entrepreneurs, with vision and ability to take risks became millionaires overnight. This also distributed wealth into the hands of technocrats, rather than wealth remaining in the hands of a few large, family-owned fortunes. It also started flowing through entrepreneurs and innovations aided by government investment and often with banks as financial catalysts.

Germany was rebuilt mainly because the war could destroy physical assets but could not destroy the Germans' technologically-oriented culture. The Japanese also recognized the importance of technology and started pushing for quality products in the world market, ultimately to become a major economic power. It is mainly because of pervasive technologies and competitive market places that the world saw significant changes in the environment and management of work.

New management methods had to evolve to emphasize productivity, efficiency, cost, quality and teamwork. New relationships were also established in traditional, hierarchical work cultures to promote an egalitarian system. It is

now well accepted that technology has been responsible for improving standards of living, bringing about social change and initiating new thinking in the minds of millions.

The role of mass communication through satellite radio and television networks is now obvious in the life of modern man. Earlier, it was thought that the mass media would be used by totalitarian regimes for propaganda and brainwashing. Yet, because of the mass media no event remains a local one. Every local event has the potential of instantly becoming a world event. The events in Romania during December 1989 took everybody by surprise because they were seen unfolding live on television by people throughout the world in their living rooms and bedrooms. Since people, living with physical and mental boundaries, now have the ability to see progress and prosperity in various other parts of the world, they say, 'Why can't I do the same thing? Why am I restricted? I also need the same product!' This builds up expectations and hopes.

In fact, there had already been a groundswell for a generational kind of a change in the Eastern Bloc for quite some time. Technology only made it transparent and more difficult to hide the developments in other parts of the world. From the media's message, it was clear that there was a larger gap between the two Superpowers and the people wanted change from a conformist to a productive system. It was clear that the State alone was not capable of ensuring development. More freedom and individual initiatives were needed as agents of economic progress.

What was now needed was the man. Mikhail Gorbachov had the right mix of the ingredients of leadership, vision, commitment, courage and communication skills. Once he took the initiative, the groundswell was transformed into a phenomenon and caught like wildfire in many parts of Eastern Europe. What would have seemed like near hallucination a decade ago was implemented in just five months. The Berlin Wall was dismantled, Romania toppled a dictator, Hungary instituted a market economy and the Baltic Republics and others started looking for their own freedom. A re-united Germany became a reality.

All this has had an impact on the concept of the European Economic Community (EEC) and a need for realignment.

Realignment is needed mainly because old ideologies and dogmas have less relevance in the nineties. Instead markets and technologies will dominate and force globalization of economies and new partnerships for products and economic programmes. To some extent, this was foreshadowed in the increasing role of multinationals, leveraged buyouts (LBO), mega mergers and the internationalization of stock exchanges. Every large company has been been trying to position itself for the market shares of the twenty-first century, with new players and partners.

Three distinct global alliances are emerging. One consisting of the US and Canada with its own huge purchasing power, second the EEC with 12 countries and a commitment to a more united Europe and third the Asia-Pacific region with Japan as the leading economic power. As a part of these alliances, the for-

mer socialist countries will have to integrate slowly but surely. They could even emerge as the fourth major market bloc with the ability to freely trade with all others ultimately on equal terms. This leaves a major question mark for the developing countries, which, in the process, may be marginalised.

China with one billion and more people and India with another potential billion will face a dire need to satisfy basic human needs, while others will emerge with united global plans for the twenty-first century. As a result, the future may well be divided into two worlds—one predominantly 'White' in control of technology and markets and the other consisting of 'Yellow', 'Brown', 'Black' or a mosaic world in dire need of technology to solve problems related to basic human needs.

This realignment not only offers great opportunities but also monumental challenges. It is clear that most of the developed world resources will now be diverted to new democracies and new alliances. Other parts of the world may well be starved. The Socialist system does not have the management approach and expertise to compete in the free and open market. Productivity and efficiency will take a long time to acquire from centrally planned and restricted trade to a totally new direction in a competitive environment. It will require at least a decade.

The Enemy of Change

The challenge is not only to get resources from outside, but also to fight old attitudes and enemies from inside. In general, people don't like change because it brings about uncertainty, anxiety, and it is always resisted by various interest groups, especially in an environment where prices are artificial and privileges are plenty for the few. Open markets and free economies are already bringing inflation and inequality, opportunities and obstacles, confusion and confrontation and many other pressures even to derail new initiatives and threaten the prospects of democracy and development.

If and when new alliances are successfully forged it will no doubt start a new war—"softwar" over intellectual properties, ideas and information. The second world will face hostility from the fact that the first world population will be ageing and decreasing while the second world will be young and increasing. The first world with 75 per cent of the land area of the world and only 25 per cent of its population will need the "brainpower" of the second world with 25 per cent of the land area and 75 per cent of the population to fuel their modern economic machines and new developments.

The saving grace may come from the technologies of tomorrow. For example, biotechnology has far-reaching implications in agriculture, environment, pharmaceuticals, health and processing. Many offer new solutions to expedite the process of development and modernization. Other technologies such as new materials, alternative energy, micro-machines, and information will shorten devel-

opment cycles, reduce costs, increase efficiency, and help bridge the gap between the haves and the have-nots. They also bring the second world closer to the first. This may lead to another major realignment before the end of the twenty-first century.

2. End of an Era

World history is full of wars, revolutions and restructuring aimed at achieving the various objectives of individuals, communities or nations. Conflicting aspirations and expectations give rise to tensions leading to fights, revolutions and wars. Family feuds, religious differences, ideological divide, economic disparity, social inequality, injustice and territorial ambitions have been the causes of war throughout human history.

Even today, the world is full of tensions and conflicts—as in Ireland, Yugoslavia, Lebanon, Iran, Iraq, India, El Salvador, the Philippines, Afghanistan and many other parts of the globe. Here guns are being routinely used to get even. Some conflicts as in Ireland and Lebanon go on for decades while others get settled in a year or so. Almost all wars bring about changes in the social, political, and economic environment and sometimes in the territorial boundaries of nations.

In the past, wars have been fought with hardware such as stones, bows and arrows, guns, machine guns, battle tanks, bombs, missiles, nuclear warheads and such other sophisticated technological equipment. The last world war was settled only by the intervention of technology in the form of atom bombs dropped on Hiroshima and Nagasaki. This gave birth to an arms race and started a new era of Cold War between the two superpowers. Having lived with the Cold War and divided world for about four decades now, humankind is preparing for a new order and new reality where ideologies are giving way to technologies and markets aimed at a new 'softwar' during the twenty-first century.

World War II brought to an end the era of aristocracy, colonization, kings and queens, domination, exploitation, feudalism and many other related concepts and social values. During the early twentieth century, these had been the concepts and values reflected in the day-to-day approach to individual enterprise, administration and trade. The end of the war gave new meaning to a global power equation, and the division of markets and technologies. It also gave rise to two distinct economic orders—one open, free and left to the market forces, and the other closed, controlled, centrally planned and carefully carved to meet supply and demand. After almost 50 years, these two economic orders are ready to merge to forge new alliances and create new conditions leading to a new world order.

All along, technology has played an important role in the process of waging wars, escalating the arms race, developing new tools of destruction, building

trade, increasing awareness, improving communications, reducing poverty, etc. The pervasive technologies and modern information systems are now forcing new initiatives and compelling freedom needed to provide prosperity for the people in the former 'socialist' countries. This explosion of freedom with deep roots in technology is bound to have an impact on the new world order and the future partnership for technologies and markets the world over. To understand and appreciate this phenomenon, it is important to review the history of world wars and the associated role of technology, trade and balance of power.

World Wars

With World War I (1914-18) began the destruction of the primacy of Europe in the international system and its empires overseas, which World War II completed. The war continued for four years and three months: from July 28, 1914, when Austria and Hungary declared war on Serbia, to November 11, 1918 when the Allies granted Germany an armistice. It was a total war in the sense that to ensure victory, the belligerents were compelled to mobilize, totally, their resources of technology, manpower, and manufacture including industries, farming, shipping, transport, communication, etc.

World War I involved mobilization of 65 million men, of whom 13 million died in action or of injuries, 22 million were wounded and 7 million permanently crippled and disabled. Growing nationalism, militarism, economic imperialism and colonization, coupled with the closed system of secret alliances were the fundamental causes of World War I. The European continent was divided into two armed camps—the Triple Alliance and the Triple Entente. The development of the cult of force and power and a feeling of insecurity among the nations of Europe led to the glorification of violence as a normal human activity.

The race for armaments and a cut-throat colonial competition as a result of the development of commerce and industry during the Industrial Revolution engendered hatred, suspicion and distrust in the European continent. The spirit of nationalism was turning the heads of many statesmen with a false feeling of national superiority. The national rivalries between Russia and Germany were mounting. All these factors led to a phase of international anarchy in which the end justified the means. In scope and intensity, in the scale of casualties and in the involvement of every national interest and employment of every section of society in its service, World War I was unprecedented.

World War II, the global conflict of 1939-45, was the fiercest and most destructive war in human history. This war saw gigantic struggles not only in Europe but also in Asia, Africa and the far-flung islands of the Pacific. The war lasted nearly six years and came to an end in Europe with the unconditional surrender of Germany on May 8, 1945, and in Asia with that of Japan on August 14, 1945. While the total losses of this war are simply incalculable, the casualties have been estimated to have run to around 25 million dead and 35 million wounded. The major participants were Germany, Italy and Japan on the side

which lost, and the United States, Great Britain and the Commonwealth, the USSR, France and China on the other side which opposed them.

War efforts engulfed all aspects of national life in almost all countries of America, Europe, Asia and Africa. For almost six years it was a drain on resources for everyone. Besides being emotionally involved, a large number of people were engaged directly or indirectly in the production of wartime hardware. The war had an impact on the economy of every major player, from the US, the UK, France, the Soviet Union and Germany to Japan. Hundreds of thousands were being killed and millions of dollars were being spent for an unnecessary blood-bath everywhere. In the process no one was winning. Six years were too long for the war to drag on. Everyone was tired and was looking for ways and means to end this war.

The three key people, the President of the United States—earlier Roosevelt and after his death Truman—the Prime Minister of England, Winston Churchill, and Stalin, Secretary General of the Soviet Union, were periodically meeting to find amicable solutions. However, they had their limitations in arriving at an acceptable compromise. A great deal of individual pride and political future of the world were at stake in reaching a reasonable settlement. The world leaders wanted Germany and Japan to surrender unconditionally, but both these countries had enormous staying power in the battlefield. Finally, on August 6, 1945, the first atomic bomb was dropped on Hiroshima. Three days later the second bomb was dropped on Nagasaki. The war finally ended on August 14, 1945, when Japan's Emperor announced surrender on the terms laid down by the Allies. World War II thus ended a week after the dropping of the first high technology atomic weapon. Technology had to finally intervene to resolve this long drawn world conflict. In a real sense technology had come to the rescue of mankind and put an end to further killing and destruction. But in the process the destructive potential of the atomic bomb was demonstrated.

The Technology of the Atomic Bomb

The story of the atomic bomb began in 1931, when Crawford and Walton split the atom and within a year Chadwick discovered the neutron. In 1934, Joliet-Curie discovered artificial radioactivity by bombarding a target with alpha particles to produce new elements. At the same time Fermi used newly discovered neutrons to find several artificial radioactive elements. In 1938, Hahn and Strassmann proved that what Fermi had observed was the bursting of the nucleus referred to as atomic fission. In 1939, Frisch and Meiber proved that during fission a large amount of energy is released. It was also confirmed that a chain reaction is likely which could be explosive. Finally, on April 22, 1939, a letter published in *Nature*, the British science magazine, by Joliet-Curie confirmed that every fission results in a chain reaction.

The man who took advantage of this discovery to build the atom bomb ultimately for the US was Julius Robert Oppenheimer. Born on April 22, 1904, of

Jewish parents in New York, Oppenheimer was a theoretical physicist from the University of California. Oppenheimer, along with General Leslie R. Groves, the military director of the project, was credited with the 'Implementation of the Atomic Technology for Military Purposes' at a secret laboratory at Los Alamos near Santa Fe in the New Mexico Mountains. Later on, Groves came to be known as the 'Atom General' and Oppenheimer as the 'Father of the Atomic Bomb'.

During early March 1945, over 200 B29s, each carrying over six tons of incendiary material, devastated Tokyo. Almost a quarter of Tokyo City was burnt out and over a quarter million buildings were destroyed. About 200,000 Tokyo residents lost their lives. After achieving enormous success with this new strategy it was decided to launch attacks on other cities like Osaka, Kobe, etc. Because of this heavy bombing the civilian morale throughout Japan, and in particular around Tokyo, declined badly. The Americans then started dropping pamphlets warning of the next targets to create further scare. This drove millions of city-dwellers to the countryside for protection and cover. This had serious effect on the production of war supplies, oil, electronics and other precious war commodities.

The three big powers—the US, the Soviet Union and Great Britain—knew that the atomic bomb was in the making. The test was scheduled for June 1945. Long before this, British consent in principle was obtained to use the atomic weapon. On July 14, when Churchill, Truman and Stalin were meeting at the Potsdam Conference, Churchill was given a brief note, 'Babies Satisfactorily Born' meaning that the atomic bomb had been successfully tested. Now it was up to President Truman, the Commander-in-Chief of US forces, to decide the fate of Japan and thereby ultimately the possibility of ending World War II.

After the successful test of the atomic weapon, the utility and the impact of its use against Japanese civilian population was quietly being discussed and debated by a small group of scientists and political advisers. Some felt that to use the atom bomb against a civilian population, specially women and children, would be morally wrong and barbaric. The atomic scientists were equally puzzled about its utility. A few felt that having spent two billion dollars on it they must test it as soon as possible. Others felt sure that using it on Japan would bring the war to an end and save many Americans from the ongoing ordeal. Some also felt that the use of the atomic bomb would leave deep scars on the American people and they would lose public support and sympathy the world over. The psychological burden of using this deadly weapon indiscriminately on innocent people would be far heavier than it was realized. Once used successfully on Japan, it would be difficult to regulate and control its future use and applications through international understandings and agreements.

Having discussed various pros and cons, the defence advisers proposed five possible targets for the two bombs that had been produced. Finally, President Truman selected Hiroshima and Nagasaki on military and civilian considerations. In the meantime, the Soviets had changed their strategy and were ready

to move into Japan. They even wanted a share in the occupation of Japan. This added a further complication to the US approach. It was apparent that the atomic bomb was a better strategy to avoid this embarrassment and bring an end to the war.

Finally, President Truman had to make his momentous decision. On August 6, the first ever atomic bomb was dropped over Hiroshima, killing some 100,000 people and destroying most of the city. The city kept burning for days. The searing heat baked human bodies along with bricks. Those who were not burnt alive then and there died a slow death from atomic radiation. The effect of this horrifying experience still remains in the minds of millions the world over. The affected families are, even after more than four decades, finding residual radiation effects in new generations. Because of news blackout and the limited communication network then available, the news of Hiroshima did not reach all of Japan. Just three days later, the second and the last atomic bomb was dropped on Nagasaki, another important business town in Japan.

The war ended on August 14. New technology did bring quick results and World War II ended six years after it had been initiated by Hitler's attack on Poland. However, since August 6, 1945, the world has lived under a constant threat of atomic attacks and nuclear warfare.

In the process, in the name of air defence, billions of dollars have been spent on nuclear armaments the world over. Because of the Hiroshima experiment both the superpowers have frantically sought new technologies of destruction as opposed to development. The arms race in the last four decades has been nothing short of madness on the part of the superpowers.

It is unfortunate that the new atomic technology had to intervene to end the war. It is also unfortunate that, as a result, more sophisticated technology was developed for waging war in the last four decades. But the fact remains that technology decided the destiny of mankind during and after World War II. This once again proves that technology has always played an important role in guiding human developments. Man has grown with technology and technology has grown with man.

The Old Order

The two world wars were marked by the end of the conservative social order in Europe. Monarchy, aristocracy and feudalism made way for the emergence of a new world order demanding freedom from colonial powers and internal controls. Three great European empires were brought down in the course of World War I. These empires were the Russian, Austro-Hungarian and German. At the end of World War II, colonialism came to an end giving birth to many independent nations.

During World War I, the signal for the collapse of the old Russian empire came from the factory strike and bread riots in Petrograd and other Russian cities in March 1917. The troops of Czar Nicholas II, under control of the

Duma, refused to act and joined the strikers. The Duma, unprepared for the revolution, elected a temporary committee which, under Prince Lvov, formed a provisional government. On March 15, the Czar abdicated. The war continued till the seizure of power by the Bolsheviks in November. The Russian Revolution, with the inspiration of Lenin and his associates, put an end to the age-old belief in the sanctity of the Czarist social and political order which was characterized by grim mass poverty, misery, grinding exploitation, a despotic government resting on a dishonest and inefficient bureaucracy, a disgruntled army and a decadent and demoralized nobility.

The years following 1945 have witnessed the dissolution of a greater part of the empire of developed capitalism. A large part of the world, which had been, right up to 1945, the colony of this or that imperial power, has now become or is rapidly becoming independent.

The era of new imperialism had started from about 1870. This system gave currency to the belief and the process of acquiring political, economic, cultural and moral domination by one country over another through power struggle, intrigues, wars of conquest, economic and military aid, economic penetration, cultural subversion, racism, missionary activities and so on. The territorial acquisitions by the colonial powers in the heyday of new imperialism, spanning the 44 years from 1870 to 1914, indicate the overwhelming power of the Western drive towards world conquest. In 1930, when European control over the non-European world was at its crest, 84 per cent of the global land surface was under the administration of Western nations.

Imperialism before 1945 was a mixture of private profit and perverted nationalism. Colonies brought financial gains to certain individuals or groups, and national honour became involved in maintaining them. While World War I had put imperialism to retreat, World War II put imperialism to rout. It was the spread of democracy and the idea of self-determination by nations which received great impetus in World War I that did much to tarnish the glitter of imperialistic concepts. World War II, with its slogans in support of the four freedoms, also did much to discredit the old imperialism.

The decline of post-World War II colonialism was marked by the metamorphosis of the British empire and considerable changes and losses in the French, Dutch, Danish and Belgian empires. The process of decolonization and national resurgence led to the liberation of around 109 countries that opened a new stage in world affairs.

To the newly independent nations, liberation meant not just freedom from colonial masters, but freedom and flexibility to think independently and work out alternative development models based on their own needs and aspirations. For the first time, they were free to work on their own problems. They now had the opportunity to break away from colonial traditions to bring about changes. However, the burden of the feudal and colonial system was too heavy to bear and the impressions the erstwhile rulers had left were too deep to erase. Colonization was not merely a political and cultural experience. It was directly con-

nected to technology and trade, which were controlled by the colonial masters. It also made a lasting impact on the psychology of individuals and institutions. The new class of local leaders, like the old colonial masters, had their perks, privileges and positions to guard. As a result, independence in many cases could not be translated into an immediate agenda for modernization. In many ways, old mentality and antiquated procedures prevailed, forcing newly independent nations ultimately to align in one form or another with the superpowers for badly needed technology and markets.

A Divided World

Since 1945, the world has been undergoing transition and qualitative change from the old order. The European states that had formed the nodal points and communication centres of world affairs before the war—Britain, France, Italy and Germany—were exhausted by the war. The world was divided into two opposed subsystems, each dominated by either of the world powers, the United States and the Soviet Union, with Europe a passive object divided between them.

On both sides of the 'Iron Curtain', politicians welcomed and fuelled the clash between the two opposite ideological camps. In the West, the Cold War and the resulting arms race were ascribed to a sinister Communist master plan of political, military and psychological warfare increasingly directed against the free world and aimed at world domination. In the East, conflicts and problems throughout the world were attributed to the class struggle; and since war is rooted in the capitalist system, the centre of counter-revolution was identified as Washington, D.C.

With greater polarization, the Western bourgeoisie and the Eastern socialist ideologies criticized each other as Totalitarian Police State and Rotten Capitalism. Each side predicted that the other system was destined to disintegrate or collapse. Major developments in both blocs ran parallel despite different internal socio-economic structures. The United States and the Soviet Union held similar positions of undisputed authority and exclusive power to formulate policy and maintain control.

Since World War II, the struggle between Communism and Western political ideas, each representing powerful coalitions of states, cast its shadow over all world politics. For many years, world affairs were dominated by a so-called Cold War. It was marked by extreme hostility between the two factions, psychological warfare and uninterrupted mutual vilification. On April 4, 1949, the Western alliance was created to wage the Cold War. The North Atlantic Treaty (the Atlantic Alliance) was an association of 12 states which declared that an armed attack on any one of them would be regarded as an attack on them all, and that each would go to the help of the ally attacked by taking such action, including the use of force, as it deemed necessary.

The key to the power equation in the socialist bloc was Stalin's rule. After

Lenin's death in January 1924, Stalin consolidated his power in the Soviet Union. He presided over the triumphs of industrialization and the horrors of famine and purges in the 1930s and was commander-in-chief during the bitter struggle against the Nazi invasion in 1941-45. Stalin's version of 'Socialism' as limited to one country was a marked departure from Lenin's internationalism. Stalin proclaimed that it was possible to attain socialism in the Soviet Union without a socialist revolution elsewhere. In order to make good the time-lag (Russia was considered 100 years behind the West) Stalin called for 'a second revolution' both in the economic and political organization.

Stalin's 'second revolution' involved a central planning bureau, five-year plans, crushing of all resistance, collective and mechanized agriculture, building up of heavy industries, reorganization of armed forces, consolidation of political control and a new constitution based on the logic: 'To keep on developing state power in order to prepare the conditions for the withering away of state power.' Under Stalin's policy of Russification in the 1930s, the minority nationalities in the Soviet Union were subjected to increasingly strict control by the Government. In 1935, Stalin started a purge (elimination) of most of the old Bolsheviks associated with Lenin. During the next few years, he liquidated all who could threaten his power. He is also believed to have executed thousands of other Communist party members, including the Chiefs and countless officers of the Soviet army.

At the time of the 1936-38 purges, Stalin declared that the absence of antagonistic contradictions within a socialist society meant that all hostile actions and beliefs came from outside that society. It was on this basis that he believed and propagated the idea of two opposite camps and two parallel markets, Capitalist and Communist, and the deepening crisis of world capitalism. The contradictory developments in the East European societies have, however, disproved this notion. Stalin's successors denounced Stalinism for fostering a 'cult of personality', dictatorial rule by one man, and the establishment of a totalitarian state.

One outcome of the Cold War was the Berlin Wall, which divided East and West Germany. At the Potsdam meeting of July-August 1945, Germany was divided into four zones—US, British, French and Soviet. Berlin fell in the Soviet zone. Great Britain and the United States, with increasing cooperation of France, concentrated their efforts on the economic and political integration of the Western zones of Germany.

In August 1961, the Soviets sealed off their sector of Berlin from the Western sectors with barricades erected overnight. The city was simply cut down the middle and this was reinforced by the construction of a 15 metre high wall, the Berlin Wall, designed to prevent any further illegal mass migration from GDR to the west. The conflict continued till 1964, when the Soviet Union signed a treaty of friendship, mutual assistance and cooperation with GDR excluding the issue of Berlin. The treaty brought to an end the Berlin crisis, but it made the division of Berlin a concrete reality to match the division of Germany. The

universal German desire for unity and independence, however, found expression in late 1989, when a mass uprising in East Germany rejected the post-war arrangements and the Berlin Wall was brought down. The process of unifying the two Germanys began once again.

The strained relations between Russia and America also led to the division of Korea. Independence to Korea was promised by the Cairo Declaration of 1943 by Roosevelt, Churchill and Chiang Kai-shek. The Cairo pledge could not, however, be implemented. This frustrated the leaders of Korea's provisional government who had returned to their country after a long exile. In the wake of Japan's defeat, the Soviet Union and the United States shared out between themselves different sections of the Japanese-occupied peninsula. Russian troops moved into the northern half, and American troops occupied the southern zone with the 38th Parallel as the dividing line. Presumably, this arrangement of convenience was to be temporary and in due course Russian and American troops were to be withdrawn and Korea was to be free. But the tense relations between the two great powers, and a series of unhappy events inside Korea resulted in a permanently divided country.

The divided world was also represented in the social and economic organizations of the North and the South which were structurally divided into two subsystems. The dominant subsystem consisted primarily of a few Euro-American states which had acquired a vast amount of military and economic power and used this power to dominate the rest of the international system. The subordinate subsystem of the South, on the other hand, consisted of the great majority of states in the world—in Asia, Africa and Latin America—which were the victims of historical imperialism, and though free, were too weak militarily and economically to resist the relentless pressure from the smaller subsystems possessing greater muscle power.

Broadly speaking, geographical North had the dominant subsystems and the South of the globe had subordinate subsystems. The nations of the South, known as less developed or Third World nations, have always been concerned about the widening gap between the North and the South. The present system causes economic inequalities and permits the richer nations of the North to deny justice to the poor ones in the South. The structure of the world economy and the existing international system of trade and development have failed to reduce the disparity in per capita income of the peoples in developing nations. These nations forged their unity through the non-aligned movement.

In the post-war period, the great powers have attached considerable importance to different types of defence like air defence against bombers and cruise missiles, passive and civil defence such as early warning systems or hardening of missile silos. With the emergence of the nuclear age and a parallel revolution in military technology, the very nature of offence and defence has been transformed. In both East and West revolutionary new technologies made their appearance. Among these were solid fuel rocket propulsion, high yield to weight thermo nuclear warheads, compact solid state electronics, computerized data

processing and infra-red sensor technology.

Independence Movements

While the arms race was being escalated by developed nations of the North, the developing nations of the South were struggling for independence from their colonial masters. Almost the entire developing world was ruled by a handful of colonial power centres in Europe. The most powerful of these was Great Britain which ruled the Indian subcontinent with a small number of white officers controlling trade and technology to and from India. The pre-world war period was the era of imperialism. After 1870, the European powers fought for colonies and markets in Africa and Asia. British rule in India may be said to have started in 1757 when at the battle of Plassey the forces of the East India Company defeated Siraj-ud-Daula, the Nawab of Bengal. Beginning from a small trading company, it expanded British rule and transformed India into a classic colony by the end of the nineteenth century.

India was a major market for British capital. She provided employment to thousands of middle-class Englishmen and nearly one-third of her revenue was spent in paying salaries to Englishmen. The Indian army acted as the chief instrument for maintaining the far-flung British empire and protecting and promoting British imperial interests in East, South East, Central and West Asia and North, East and South Africa. During the years after 1760 when Britain was developing into the leading capitalist country of the world, India was becoming the 'leading' backward colonial country of the world. The entire structure of economic relations between Britain and India involving trade, finance and technology continuously increased India's colonial dependence and impoverishment.

The independence movement in India was led by a small, simple, English-educated Indian barrister with enough background of fighting discrimination in South Africa—Mohandas Karamchand Gandhi. Gandhi's movement caught the imagination of millions in India and abroad and started a chain reaction for many in Africa.

Non-violence was the central core of Gandhi's philosophy. He revolted against injustice, discrimination and degradation. After a long struggle of two decades, he evolved the technique of *Satyagraha*, based on truth and non-violence. Gandhi was involved in a heroic struggle against the racist authorities of South Africa. The ideal *Satyagrahi* was to be truthful and perfectly peaceful, but would refuse to submit to what he considered wrong. This struggle was to be part of his love of truth. But even while resisting evil, he would love the evil doer. In Gandhi's eyes, non-violence was not the weapon of the weak and the cowardly. Only the strong and the brave could wield it.

In a famous article in his weekly journal *Young India*, he wrote in 1920: 'Non-violence is the law of our species, as violence is the law of the brute, but where there is only a choice between cowardice and violence, I would advise

violence. I would rather have India resort to arms in order to defend her honour, than that she should, in a cowardly manner, become or remain a helpless witness to her own dishonour.' Gandhi's *Hind Swaraj* was a response to the attempt of some individuals and political groups to free India from British rule through violence. Violence was for Gandhi an inevitable result of the values that undermine modern civilization and its institutions.

The national struggle against British imperial domination began during the second half of the nineteenth century. The full flowering of national political consciousness was the result of the clash of interests between the Indian people and the British rulers. Nearly one hundred years after the British conquest of India, popular discontent took the form of armed resistance. The revolt of 1857 by the Indian soldiers of the Company's army was much more than just *sepoy* discontent. It was in reality a manifestation of the people's accumulated grievances against the administration and their dislike for the foreign regime.

The formation of the Indian National Congress in Bombay in 1885 marked the beginning of nationalism as an effective political force. Under the leadership of the Congress, India waged a prolonged struggle for independence from British raj. It was the most articulate and most highly organized agency of protest against British rule and of the demand for complete *swaraj* or self-government. After 1917, the Indian national movement came under the leadership of Gandhi. He launched a campaign of non-violence and non-cooperation to fight against the British raj. The failure of the Cripps Mission in 1942, which recommended dominion status to India after the war and retention of 'the control and direction of the defence of India as part of their World War effort' led to the Quit India movement. In the post-war period, Indian nationalism achieved its objective of independence. Lord Mountbatten, the then Governor-General worked out a compromise plan and India became free on August 15, 1947. But the country was partitioned.

With India's emergence as an independent nation, the ideologies of Imperialism, Fascism and Colonialism suffered a severe setback and democracy as a form of government made its appearance in many parts of the world. Millions of people in Asia, Africa and Latin America were inspired by the democratic ideals to fight for their own freedom and self-determination.

All these newly independent nations had two options before them— Democracy or Dictatorship. Democracy, which is people's government based on their full consent and representation, has been preferred by many. The concept of democracy incorporates in itself a free, open and well-defined relationship between the individual, the society and the state. It is a way of life in which the individual is an end in himself. The state is simply the protector of his interests and rights. In a democracy, changes in government are made peacefully through the ballot box. It should be responsible and accountable, and allow free opposition, free press, and free judiciary.

Dictatorship, on the other hand, is a form of government in which a person

or a group possesses absolute power without effective constitutional limitations. In the present-day world, non-democratic or anti-democratic regimes are often denoted as dictatorships.

In Africa, national resurgence was seen at its height in the 1960s. This national resurgence transformed the African continent beyond recognition. African awakening after World War II witnessed the freeing of one enslaved country after another. The pan-African movement forged an unprecedented unity in the struggle against foreign domination. World War II spread ideas about human rights and loosened Europe's hold over Africa. The contrast between the status, the wealth, the standard of wages and living conditions of the white minority and those of the native majority created enormous political consciousness. As Friedmann pointed out, 'If the revolt of Asia against the West is the most important international development of our generation, the awakening of Africa may be the major preoccupation of the next.'

At the beginning of the century, only Liberia and Ethiopia in the continent of Africa were independent nations. After World War II, numerous other nations became independent. In 1946, the mandatory powers of Africa—Britain, France and Belgium—agreed to place their mandate under the trusteeship system of the United Nations with the result that the former mandated territories of Tanganyika, the Cameroons, Togoland and Ruanda-Burundi became trust territories under the former mandatory powers. Independence gave these African nations the idea of forging African unity. At the Bandung Conference of 1955, independent African states participated on equal footing in an international gathering. The spirit of Burundi was preserved and for the first time all independent African states met on African soil in Accra in 1958.

The pan-African movement launched at Accra received a new impetus in the Addis Ababa Conference of May 1963. It signified the birth of a new Africa determined 'to forge unity among all African peoples and to drive out imperialism, racialism and colonialism from the African soil'. The struggle for freedom is still continuing in Africa. With the release of Nelson Mandela of the African National Congress and the freedom of Namibia from the shackles of South African domination, the process of change all over the world has been speeded up.

Back to Work

The destruction of Hiroshima and Nagasaki, and the resultant loss of millions of human lives was, to the world community, a shocking demonstration of the devastating power of the atom bomb. Now that the war was over, it was time to pick up the pieces and build a new world order with hopes and aspirations for peace and prosperity. It was time to review, reflect and react with a great deal of caution to preserve what had remained and prepare for all eventualities. It was time to leave behind old values and move on to face the new situation.

It was time to get back to work to mobilize resources to rebuild Germany, Japan and many Eastern bloc socialist countries. All those who had participated

in the destruction and survived also had to participate in the task of reconstruction. Technology, management, manpower and investments were needed to build houses, roads, institutions, industries and infrastructure which had been totally destroyed. If one set of technologies destroyed the cities, another set was required to rebuild them. This reconstruction had to be accomplished within two separate economic systems, one moulded after the American free enterprise system to prevail in Germany and Japan, and the other based on the centrally planned system of the Soviet Union in the Eastern bloc nations.

All economic life involves planning. To plan is to choose from various alternatives and act decisively with a purpose. Choice is the essence of economic activity. Economic planning is a conscious and carefully thought out process, initiated by the state, for estimating the potential wealth of the country and for utilizing the available resources as efficiently as possible with a view to fulfilling long-term objectives. Planning also involves giving direction to people with incentives and disincentives.

Arthur Lewis draws a distinction between planning by 'direction' and planning by 'inducement' for mobilizing resources for the plan. Planning may also be distinguished as 'imperative' or 'indicative' planning. Planning by direction is an integral part of a socialist society. It entails a complete absence of *laissez faire*. There is one central authority which plans, directs and orders the execution of the plan in accordance with predetermined targets and priorities. Such planning is comprehensive and encompasses the entire economy. The major drawback of planning by direction is that it is associated with a bureaucratic, totalitarian regime and has built-in controls and gatekeepers. Rationing, licences, quotas and controls are its main props, which normally leads to corruption and nepotism. Again, in planning by direction there is always a 'shortage of something and surplus of others'. It is a costly affair and finally it leads to a procrustean tendency, i.e. excessive standardization of the wrong type because it makes production easy, leading to retardation of initiative, innovation and enterprise.

Planning by inducement means planning by manipulating, managing and mobilizing the market. There is no compulsion but persuasion. Freedom of enterprise, of production, of consumption exists. People are induced to act in a certain way through various monetary and fiscal measures, such as price subsidy, rationing, etc. The major drawback is that the incentives offered may not be sufficient to get the desired results from the plans. Again, market forces may not always provide quick and efficient optimal solutions and shortages become rampant.

Whether a country adopts planning by 'direction' or planning by 'inducement' depends on its system of government. A socialist system will adopt the former and a free enterprise system the latter. But then, both the techniques are complementary. Planned economies in essence accept two techniques of financial and physical planning. While financial planning is for removing distortions between supply and demand and for calculating costs and benefits of the various projects, physical planning seeks to work out development implications in terms

of factor allocations and product yields so as to maximize incomes and employment.

American free enterprise is based on individuals and companies. It stresses private economic decisions, both by individuals and by companies. A free enterprise system is also called a private enterprise economy, a market economy, or capitalism. It is an economic system based on private ownership of all kinds of property and an individual's freedom to contract with others and to engage in economic activities of his choice for his own profit and well-being. Such governmental restrictions as are placed on private property and freedom of contract are designed for the protection of the public. Zoning restrictions regulating building operations or land use and the exclusion of agreements involving an illegal act are cases in point.

In a free enterprise system, the Government plays a relatively minor role in economic life, its functions being mainly those of maintaining order, preventing abuses, and carrying on such activities as cannot be pursued by private enterprise with reasonable assurance of profit. No country has ever had a purely free enterprise system. Changes are made in an attempt to ensure the welfare of a large number of people. Many economists use the terms 'mixed free enterprise' and 'modified free enterprise' to describe economies that rely mainly, but not entirely, on free enterprise. These terms are applied to the economy of the United States. Though the United States still has a basically free enterprise economy, the economic role of the Government has greatly expanded over the years.

Japan, which had to build from scratch after World War II, is now among the most successful examples of modern economic growth. Between 1948 and 1973, its gross national product (GNP) grew by a factor of about ten in real terms, a figure 2.5 times as high as the world average. Japan's 'economic miracle' began after the destruction caused by World War II and the ensuing years of reconstruction and rehabilitation. Since 1950 Japan has had a more rapid industrial expansion, even greater than the remarkable recovery in West Germany's industrial output. Technology imported from the West, and particularly from the United States, has been basic to Japan's rapid productivity gains in the post-war era. Much of Japan's own technological effort took the form of ingenious adaptation of imported technology through improvements with quick commercial payoffs. Closely related to this was the extremely high level of fixed capital formation (more than 30 per cent of GNP) maintained by Japan during the 1950s and the 1960s.

It was not very long ago when Japan was known for her dolls and cheap toys. Japanese products till after the war were considered inferior and lacked world class international quality. They could not conceive of competing in high technology products such as machine tools, automobiles, electronics, computers, etc. They started modestly by borrowing and transferring low-to-medium technology from America to build consumer products. With determination, perseverance and sheer hard work, within two decades they built a solid foundation

for engineering capabilities. Thereafter, within a decade they entered the world electronics market in a big way with Japanese radios, televisions, tape recorders and any other gadgets. Within the next ten years, they entered the automobile market and captured a major share of the US foreign auto market. In addition, they started investing heavily in computers, communication and components and became a leader in major high technology markets the world over. In the short span of 40 years, Japan was not only rebuilt but became a major financial power.

3. Technology

Technology today is a highly complex business with a great deal of implications on social, political and economic activities. Technology has many dimensions, meanings and messages for people. In general, technology is seen as something urban, elite, alien, modern, exotic, fanciful and, to some extent, sexy. Technology is hardly seen as a mechanism for problem solving.

When the technology of the atomic bomb was used to settle World War II, it had far-reaching consequences on the realignment of the world powers, economies and markets, resulting in the Cold War and the arms race. Fifty years later, pervasive consumer technologies and modern information systems with roots in democratic processes are once again forcing new realignments the world over. This new alignment is fuelled by the call for democracy from the Eastern bloc and socialist nations which have been alienated from the fruits of these pervasive and cāsumer technologies. To appreciate the role of technology in the process of democratization it is important to discuss issues related to history, application, innovation, management, entrepreneurship and major technological developments.

Man alone among animals is capable of controlling his environment and developing tools and techniques to dominate his natural surroundings and conditions. These tools and techniques are collectively called technology. Technology has, for a long time, shaped, reshaped, changed and rechanged the world we live in. Technological advances force us to have a new look at traditional well-established methods and ways of life and bring about social adjustment and restructuring. As a result, technology is very often opposed by many. Technology is a tool; it is only as good as, or as bad as, the use to which it is put. Technology is required for nut-cracking and also for energy, agriculture, and food processing. Today technology is synonymous with high-tech. Invariably, when we think of high-tech we relate it to computers, satellites, micro- electronics and many other modern 'soft' technologies which have found applications in almost every product and service around us. It is not appreciated commonly that high-tech is required also for water source finding, geohydrological surveys, vaccines, agriculture, sanitation, water management, construction and other basic needs.

Some of us use technologies and others abuse them. Machines and materials, and tools and techniques are as effective as the people who create and manipulate them. The purpose of technology is to find a more efficient and easier way

of doing things and thus pave the way for progress. If the new way is judged to be worse than the old way, one can simply stop using it. Fear of adopting a new technology essentially means blocking progress. No doubt there are problems associated with technology. But these problems basically pertain to the men themselves, because ultimately applications determine the implications.

Besides technology, the other inputs for economic and social development are time, energy, material and appropriate manpower. Contrary to what people may think, technology, time and skilled manpower are scarce commodities, but energy and material resources are available in abundance. For example, the energy we receive from the sun amounts to 175,000 million mega watts, whereas the total energy used on earth is less than 10 to 15 million mega watts—a very small fraction of the solar energy potential available to our planet. Similarly, a tremendous amount of material, minerals and energy resources are available from the vast ocean covering three-fourths of our planet. What is not available is proper technology and tools to exploit them. The key to exploring and exploiting new frontiers is skilled manpower. It must be emphasized and re-emphasized that technology concerns not only machines but also people and knowledge to run them and produce goods and services for distribution to the masses. Technology also implies change—not just in products and processes but also in attitudes and awareness in a person's mind and methods, mood and a society's movement. It must be recognized that in modern society, below a certain minimum level of technology, providing basic human services related to health, housing, food, clothing, and consumer products becomes difficult. Admittedly, development related to these basic needs is mainly a political and economic activity. Also, as basic needs are being provided, human aspirations increase, expectations rise and people demand more development and better standards of living which are feasible only through new technologies. Technology is necessary for development but is not sufficient.

What made man acquire technology? It must have been the realization that he could increase his comfort by doing things with objects outside his own body. For example, by developing tools for hunting he increased the kill probability while minimizing risk to himself. Similarly, by developing shelter he could protect himself against bad weather. It is the same basic human urge to be more and more comfortable that has driven technology for generations to create new products and services, new markets and new manufacturing facilities to meet the ever-growing demands. Modern technology has increased human awareness and exposure to such an extent that people everywhere appreciate and desire the freedom and flexibility, products and services, that technology offers, to help decide their own destiny and development.

History

For millions of years, man interacted with nature without any tools or technologies to exploit basic resources like water, forest, fishes, etc. Man developed

hand tools for hunting and for construction only two million years ago. This was the beginning of a technological revolution which ultimately led to greater mastery over nature and the environment. The next advance came only some 50,000 years ago. By using fire, man started experimenting with cooking, communication with smoke signals, and warding off darkness and the chill of the night. He discovered that food heated by fire had a pleasant flavour and was easier to chew. Fire also meant an outward extension of man's living range. He was no longer confined to the natural environment to which his naked body had adapted. Now he could create heat in cold and tailor environment to his needs. In this phase, man still ate whatever he could find from nature in the form of fruits or vegetables, or from hunting and fishing. Agriculture had not yet been discovered.

Agriculture came to be widely practised only some ten thousand years ago. Though tools were invented for cutting grass and grain, corn and vegetables, agricultural innovations and experiments are only around five thousand years old in our civilization. Agricultural activity was predominantly related to nature. As a result, wherever there was water there was an agricultural revolution and people started settling closer and closer to rivers and water basins. In other words, the agricultural revolution stopped nomadic life. Nomadic cultures were not in a position to pursue science and technology. Being constantly on the move they never had the stable infrastructure to pursue knowledge systematically. These societies were also operating at small-scale consumption and were concerned only with day-to-day survival. The need for greater knowledge arose only after the agricultural revolution when people had to settle at one place to harvest and explore resources like land and water. As part of the agricultural revolution, man started to abandon the practice of hunting, gathering food and wandering as the main primary activity and focused his attention on organizing inputs for land, labour, water, etc., at one place to create conditions conducive to permanent settlement. This also created a need to organize information for new tools and technology and increased interaction in a community.

Some 5,000 years ago artisans recognized the importance of materials and metals, especially copper, silver, glass, ivory, etc., as basic raw materials for developing new tools. As technology developed, people developed abilities for reading and writing, for communication and creation. The pyramids in Egypt and the ancient temples in India are examples of great human creations in architecture and construction technology. Throughout these developments animal power was critical. Animals were used for ploughing and transportation.

After the fall of the Roman empire (A.D. 495) developments shifted to the East. Arabs, Indians and the Chinese got into chemistry, mathematics, astronomy, and printing and many other trades and technologies. Printing was another revolution which spread literacy all over the world and further enhanced development, technology and trade. In the last 200 years, specially from the year 1700, a great deal of technological development has taken place. Earlier, technology was related to primitive agricultural activities and dealt only with nature

and natural resources. During the second revolution starting 1700, namely the Industrial Revolution, technological activities started dealing more with mining, metals, machines and manufacture.

In 1760, when the steam engine was invented by James Watt, specific direction was set to multiply the power available to man by shifting away from manpower to machine power. In 1800 a whole lot of machines were developed for various applications. The central objective was to minimize muscle energy, and instead use mechanics and metals to leverage forces. Industrial revolution essentially started a new kind of thinking to create work and to conquer nature. For example, earlier the concept of travel was related only to waterways and animal power. Then it was changed to trains and tracks and now to supersonics and space shuttles. The Industrial Revolution left nature far behind and initiated a new pace for her conquest through new technology and innovations. Man realized that he could go far beyond nature and even explore outer space by developing new technology and new products. The Industrial Revolution led to unprecedented increase in prosperity and population. With factories mushrooming all over, people moved closer to the centre of machines and production. As a result, urban centres were established and major townships and economies were created around manufacturing operations. People started moving away from the rural agricultural base to the urban industrial base.

In early 1900 an American engineer, Henry Ford, started another quiet revolution which led to assembly lines, mass production and mass merchandizing. His technology was to standardize products and parts in such a way that individual components could be arranged and interchanged on the assembly line for large-scale production to reduce cost and increase productivity. Automobiles were produced in this way in Detroit plants. Mass production led to easy availability and affordability. As a result, public preference changed in the US from mass transportation with trains and buses to private transportation. However, for the auto industry to be effective, just producing automobiles was not good enough. Roads had to be built, laws enacted and systems set up for policies and procedures, to create an infrastructure for growth and expansion.

By 1930, most industries were mechanized and mechanical equipment started appearing in common homes. This process of automation once again started new developments in the 1950s and 1960s. Washers, dryers, ovens, refrigerators, blenders, air-conditioners, mechanical calculators, data processing equipment, television, etc. led to improved standards of living.

Technologically, what was not achieved in human history for the first two million years was achieved in the last 200 years because of constant improvement in materials, products and services to manipulate and master nature with ideas, innovations, knowledge and information. The post-industrial age reflected man's will to improve and enhance his living conditions.

New information technologies related to databases, communication networks and knowledge in insurance, finance, management, leisure, travel, education, training, etc., are now replacing hard manufacturing technologies. These new

knowledge-based technologies are aimed at increasing productivity and efficiency of man and machine together. In the resulting information age communication, community participation, personal interaction, interpersonal relationships and the role of individual ideas, innovations and knowledge will guide the destiny of new developments.

It is important to emphasize that before technology develops, science has to be developed. Science relates to fundamental laws of nature and technology relates to application of science. Both together create new products and methods which are interesting, attractive and applicable. Both are an integral part of human history, development and culture. Both have far-reaching impact on the standard of living. Science for a long time has been misunderstood, resisted, criticized, praised, and defied, but has always created new hopes and expectations to deal with the environment at home and at work.

Technology and Society

In the past 200 years the relation between science and society has undergone radical changes. Science has become an integral part of day- to-day life with electricity, automobiles, telephones, motors, machines, tractors, trains, radio, TV, etc. Today, societies are judged by their technological capabilities. The techno-cultural gap identifies societies as advanced, developed, developing, or underdeveloped. All advanced nations are technologically advanced and all developing nations are technologically developing. As a result, the economies of the latter are far behind those of the advanced nations. Almost all developing societies were colonies of the Western world at one time or another. Colonialism was not simply a political experience, but also a cultural one closely tied to technological developments.

Technology, like a human being, has a life cycle. It is conceived with an idea in a person's mind. This idea takes birth in the form of a concept, product, application and goes through infancy where one tries out an experiment, builds a prototype, puts it in the field, gains some experiences and then gets ready to produce. At that time technology goes into the growth stage leading to the mature product and well-defined market-place. As the demand for the product increases, technology moves to peak performance and starts earning profits. After a while, it matures and reaches a steady state level and at that point of time it gets into aristocracy. Thereafter, if not updated, it goes into early bureaucracy and finally dies a natural death. Each technology goes through this life cycle. What makes sense today, probably will not, a few years from now. Every technology creates its own ancillary base from which one can build improved products and create new technology.

There are many dimensions to technology—need, use, assessment, selection, development, transfer, maintenance, application, etc. Similarly there are many players in any technology game—buyer, seller, user, receiver, promoter, distributor, owner, developer and implementer. Earlier it took a long time to de-

velop technology and products. For instance, photography took almost 112 years to translate the concept into a product, namely, the camera. Telephone took 56 years to translate the concept from theory into an instrument. Radio took 35 years, radar 15, television 12, transistor 5, and integrated circuits 3. In today's fast changing environment, it normally takes less than a year to develop a new product. This has been feasible because knowledge doubles every five years and larger and larger infrastructure is available from a vast pool of knowledge base.

Technology has an impact on the masses and individuals only when it is pervasive. All technologies go through four major stages. First, when the technology is born, it is normally a laboratory curiosity. Then it is transferred into a tool, which very few people use. Thereafter it goes into manufacture to become ultimately popular and useful. It is only when it becomes very popular, beneficial and pervasive that it makes an impact on society at large. Many technologies never go through all four stages. Some die as a laboratory curiosity, while others die in the manufacturing plants and never make it to the markets. It is only when technology becomes popular with mass appeal and applications that it has an impact on our culture and our way of doing things. For technology to be pervasive it has to be simple, user friendly, popular, useful and mass produced and mass merchandized. For this infrastructure has to be available not only to develop and manufacture products but also to sell, install, manage, maintain, service, repair and a whole lot of other related activities.

While technology has solved many problems of the world it has also created problems. In some industrialized nations it is fashionable to attribute to technology all human ills. It is easy to blame technology for pollution and dehumanization of people and society. Many developing nations also blame materialistic values in the advanced nations. In their judgement it is a result of technology. In other words, technology is seen not only as a sign of progress but often as a risk in our effort to create a better world.

All new technologies are resisted at first. For example, when automatic dialling was invented for the telephone, operators in the US went on strike fearing a risk to their jobs. Their argument was that the technology was essentially designed to make every human being an operator. Had their logic prevailed, in order to handle the amount of telephone traffic in the United States today, almost every human being beyond the age of 10 would have been a telephone operator.

Similarly, when the sewing machine was invented, thousands of tailors must have feared large-scale joblessness. Even today, a great debate is going on in many developing nations on the application of computers. In general they assume that computers will eliminate jobs and as a result they see in computer applications a lurking enemy of the labour force.

New technologies create new work, new products and new ways of doing things and automatically replace the old norms. This process of change is essential to and unavoidable with technological development. In developing na-

tions, there is a great deal of debate on appropriate and intermediate technology, advanced and basic science and many other applications and implications of science on their traditions, environment and people at large. There is this concern also about utilizing traditional science. For example in India there is a large reservoir of knowledge in traditional medicine related to health which is perennially competing with modern medicine. All major government programmes are based on modern medicine and traditional methods get very little funding. The knowledge base of traditional methods remains unorganized and as a result cannot be replicated. By definition, science should be replicated time and time again to give the same results. If traditional science methods cannot be organized, they will die a natural death.

Human society is to some extent self-generating and a self-organizing system which operates on the basis of a variety of input, information and resources. Its complexity increases because it constantly builds on new experiences, new information, new variables and new expectations. The complexity is manifested in structures, functions, thought and action. As a result, every generation learns to do more complex things without any significant effort. For example, children born after the 1970s take for granted that going to the moon was no big deal. It has already been accomplished and did not require any adventure. This piece of information gives them a different base to think from. Similarly, I find that whenever I have been to arcade game parlours with my young children I had great difficulty in reading and understanding operating instructions, while my children like other children of their age group never read instructions. They put in their quarters and push buttons and move joy-sticks to score and beat the machine. Their reflexes and responses are phenomenal and come naturally to them. It becomes a part of their new culture. This complexity is also reflected in the human nervous system. It is believed that over a period of time the size of the human brain has also increased significantly.

In a society equality brings equal access to social, political and economic resources. In earlier civilizations, there was hardly any equality and as a result there was a caste structure. The distance between the rich and the poor was indeed very large. As societies became more modern and complex, equality and access to development increased because of spreading knowledge and information. Technology brings in new information, new development, new challenges and new complexities. As societies evolve technologically, complexity automatically increases. Also, more complex societies are more powerful than less complex ones. Tribals living in isolation with the culture they have preserved for thousands of years are always threatened and dominated by modern man and his complex technologies.

As societies become more complex the demand for goods and services also increases simultaneously. Take the information systems prevailing in 1500 when messages were transmitted through horses and messengers and were indeed delivered in a day or so from door to door. As societies became more complex, postal systems were introduced and trains started carrying mail. Now mail

is being carried by jet planes from one corner of the globe to another. But this process still takes days to reach the messages. It is only after the electronic revolution that it has become possible to transmit messages within seconds anywhere on the globe. Because of the ever increasing complexities, now hundreds of messages arrive in a day. To manage this we have electronic mail, voice mail, electronic filing, sorting etc. All this complexity is to simplify the simple task of communicating. In other words, increasing demand for technology, machines, trains and aircraft, telephones and telegraphs, fax and fibre optics has not necessarily increased the response time for messages significantly. If it has, it brings with decreased response, increased complexity. New complexities bring in new innovations and adaptabilities to make the task easier and user friendly. However, the overall task itself turns out to be much more complex, because of sophisticated machines and necessary highly trained technical human resources.

As technological complexity increases, it becomes important for the innovator to hide the complexity from the user. Only then can these technologies be user friendly and pervasive. When you drive a car, you really do not know or care to know any of the technicalities that go into its making. Similarly, while vacuum-cleaning your house you rarely appreciate its motor and suction system.

All societies have developed significantly during the last two centuries, and have increased manifold the complexities involved. Knowledge has increased, technology has evolved and new products and services have been provided in abundance. New problems have been solved and new challenges faced. The human race has seen a startling change in lifestyle all over the globe. All this has to do with technological developments and their impact on standards of living.

There indeed had been great civilizations in the past with scientific traditions. But only eighteenth century science by Europeans was successful in transforming world and creating prosperity and progress everywhere. This happened in a very short time. Especially, the developments in the advanced nations are nothing short of miracles. The same European technologies have also helped create miracles in Asia, Africa, South America, etc., in eradicating smallpox, improving communications and helping the green revolution.

It is fashionable to say that modern technology from the industrial era is used only for exploitation and manipulation, that it is based only on acquisition of material and as a result downgrades human values and spiritual upbringing. Unfortunately, the importance of modern technology to bring green revolution, to liberate us from hunger, and knowledge to liberate us from superstition and ignorance is little understood. Because of this poor understanding of technology, culture, personal prejudice, political consideration and patronage play an important part in the interpretation of facts and figures, productivity and analysis. Technology does introduce a desire for the general welfare and helps distribute justice equitably. Even a simple technology can change the world drastically. Take Newton. Sitting under a tree he had an opportunity to analyse the falling

of an apple and thus discover the basis of gravitational force. This led to the whole new Newtonian revolution and gave birth to new mathematics and new mechanics.

Every society faces many problems, which have no scientific solutions. But for problems that can be solved, scientists with logical thought and analysis can provide solutions without prejudice. It is because of this thought process that scientists and scientific approach and reasoning are needed everywhere in the modern world.

Modern technology has helped bring many traditionally simple societies in contact with, and sometimes in conflict with, more modern and complex societies. For example, a tourist industry in a very traditional society can create a whole new set of perturbations for the local population. Though tourists bring additional earnings and prosperity for the locals they also bring new values and approaches. The local people get to see the gadgets and the likes and dislikes of the tourists and slowly but surely begin to mould their products, services, behaviour and social interactions to please the tourists and imitate the foreign cultures. With a heavy influx of tourists a traditional society may change so drastically that it will lose all relation to the past heritage.

Similarly, a plan to build a large defence industry or a military cantonment in remote rural areas is bound to have a major impact on the lifestyle of the community. Land prices go up, people get displaced and a class of nouveau riche is created with all the money but no place to spend it. Thereafter new jobs and new services come in. With new people new cultures get blended and what emerges is a whole new community with different values and work, making new demands on the old community.

In the traditional system, knowledge and power were concentrated in the king, the nobility and the priests at the top, who provided inputs, orders, and work for people at the bottom. Those who wielded power had the wherewithal to deal with policies, politics and information-related activities. The civil servants, the army, the merchants, etc. formed the middle class to deal with administration and its infrastructure. Modern technology has not changed this structure from the viewpoint of information exchange. The upper class in our society still wishes to monopolize information generation and exchange, while the lower class finds a lesser role for information and related activities. People at the top make sure that information does not flow vertically to lower levels but only horizontally to their associates when necessary. For them, information is a resource to be manipulated and managed for distributing patronage, privilege and power. Those at the top have a reasonable amount of free time and are involved in non-repetitive activities. They possess an infrastructure and instruments to monitor and manage time and information. People at the bottom, being involved in repetitive activities, hardly have time to deal with information and are constantly alienated from the power structure. As a person at the lower level begins to deal with more and more information, he or she automatically begins to rise up the social ladder to move closer to people at the top. For this, accessi-

bility to various information systems becomes critical.

In a society with open information systems if people are free they tend to innovate and experiment. Restriction of a person's freedom to participate in a society along with restriction on information flow restricts that society's resources. Therefore, it is the duty of society to create conditions in which every capable person can openly make use of a large amount of information and knowledge to communicate and contribute with comfort to developmental activities. Then only will a new society emerge with freedom of mind to change and adapt itself to new challenges.

Technology at Work

Technology has been hard at work for the last two centuries in many critical areas with a significant impact on society, that is, on individuals, as well as on business and government. Modern technologies have not only increased human comforts all around, but have also penetrated many boundaries to find application and use in the remotest corners of the world irrespective of politics, ideologies and/or social environments. The application of technology in transport, electronics and entertainment and consumer products has been far more visible with mass impact and mass appeal the world over. These applications have changed the age-old concepts related to time, space, accessibility, availability, ownership, social status and many other virtues and values.

Technology has brought people closer and enabled them to travel long distances at supersonic speed. Technology enables one to witness in one's own living room, on television, major world events at the same time as they happen. Television has indeed made people more aware of the world around them and of the available options and opportunities to guide their own destiny. This exposure has increased hope and aspirations in the minds of millions.

Technology at work has bridged the gap between the haves and the have- nots in some areas and increased it in others. In the process it has increased equality with open and equal access to its fruits to those willing to work for it. Technology has also had tremendous impact on living conditions, human behaviour, interpersonal relationships, management methods and many other aspects related to day-to-day human desires and expectations.

Transportation: Transportation technology has been one of the most visible, moving material and people on land, sea and in the air. Developments related to transportation started perhaps with the invention of the wheel. Animal power and wheels were the moving forces in transport for several centuries until mechanical technology introduced pulleys, gears and chains to substitute for human muscle power. The major transformation in transport service occurred with the introduction of railways and automobiles.

Railways were reserved for massive public transport with tracks and trains while automobiles gave new meaning to personal transport for a variety of ap-

plications such as private cars, tractors, trucks, buses, for recreation, agriculture, and leisure activities. The automobile industry created a major economy in the Western world with millions of new jobs in the last century. With Henry Ford's assembly lines and thousands of ancillary industries, it fuelled unprecedented growth within a very short time to provide ultimately at least one car per family in the US. This required mobilizing market support and many other small entrepreneurs to provide spare parts for the ever-growing assembling operation. The private auto market has now created small cars, big cars, luxury cars, sports cars and hundreds of options and variations to meet customers' choice, demands and fantasies.

The invention of the automobile was not enough to get the private car market and the transport system going. Roads had to be built, laws had to be enacted, traffic lights had to be installed and people had to be trained for the driving licences. This required a multi-billion dollar investment in infrastructure. A whole new auto culture had to be developed. With this, in 50 years it ultimately made the automobile a prized possession for every family in the Western world. With the auto came a sense of direction and instant mobility to everyone who could handle this new machine.

The automobile was designed in such a way that the user was essentially shielded from the complexity of its technology. The complex electro mechanical arrangements with radiator, carburettor, motor, generator, engine block, battery, brakes, etc., were hidden under the hood for this technology to be pervasive. Ultimately, the user was given a key to turn on the engine and a place to sit, with a wheel to steer the automobile. In fact, in the last ten years, automobile technology has started using complex electronics in a big way. Now with synthesized voice chips and micro processors, many functions are controlled automatically. Instructions are also given in human voice to simplify many functions and features. For example, now auto electronics will remind you in a soft human tone to buckle your safety belts, that you have forgotten keys, or have left a door open.

The same automobile technology has also given trucks to move heavy materials, tractors to plough our fields, and buses for urban and long distance mass transportation. The human search is still on for faster, safer and better auto technology. But now along with technology and its applications new physical and social structures are needed to take the next leap forward. In the last 50 years, the auto revolution has affected every human being in one form or another. It has also changed their concept of time and distance.

Similarly, transportation at sea has changed from wooden row boats to highly sophisticated motorized and air-conditioned pleasure boats, huge ships sailing across the oceans and submarines sailing under the sea, exploring new minerals and marine life. The fishing industry has been completely transformed because of the technology at sea. Even more drastic have been the changes in air transport. A hundred and fifty years ago it was not even conceivable that man could fly, though for centuries he had been trying hard to get wings. Looking at birds

and kites man always had a dream of getting wings to move across the sky. It was only with the efforts of the Wright Brothers and after many unsuccessful experiments that man learned to fly in the last century.

Today thousands of huge aircraft roam the skies day in and day out to move millions of people from one part of the globe to another. These machines, carrying almost 400 people in modern comfort, travel at a speed of 500 miles per hour. Air transport technology has brought our world closer. The distance that took months to travel in the past, now takes only some hours. These machines are very complex with hundreds of technologies integrated together and require highly sophisticated training for the pilot. Now, with powerful computers even piloting is being taken away from man and turned over to the built-in computers with better accuracy, precision and adaptability.

These technologies, equipment and applications have not remained confined to the advanced nations of the West. They have now been effectively utilized in every corner of the globe, though not to the same extent. In many developing nations these modern technologies go hand-in-hand with the traditional mode of transport. In India, bullock carts have been used to transport satellites to the launch site. Similarly, elsewhere private jets have been used to move cattle around. Transport technology has had the greatest impact on the globalization of modern business. Nowadays, it is common for people to commute to work by jet planes. I myself did this for almost two and a half years, commuting between Delhi and Chicago. When I left for the USA in 1964, just 25 years ago, I had no idea that one could commute to work once every two weeks from the US to India. I have many friends in the US who commute from Florida to New York, from San Francisco to Los Angeles, etc., routinely to attend their offices.

While working at Rockwell International, in Chicago, we used to visit our headquarters in Dallas once a month for corporate presentation and briefing. Normal routine was to get ready early in the morning and reach the airport before 8.00 a.m., where our corporate plane would be waiting. In the plane, eight of us would start our meeting and would have an opportunity to interact for almost two hours without distractions. Upon arrival in Dallas at the small local airport, cars would be waiting to take us to headquarters. At headquarters, our secretaries would have messages from Chicago to follow up on. By then it would be time for lunch.

Normally, after lunch, around one p.m., we would start our presentations to the big bosses, to give them the status report and discuss other key issues. Then it would be time for coffee-break and some more messages from Chicago to deal with. After a brief interaction with the staff at headquarters to clean up pending issues of the month, we would be ready to go back at about 5.30. On the way back once again, we would have a chance to discuss our performance, issues raised at headquarters and a drink or two at the end of a hard day. Normally we would arrive back in Chicago around 8 p.m. We would thus spend 12 hours just to have a two- hour meeting.

There were two sides to this corporate jet travel to headquarters. One, we

could probably accomplish the same job with a good tele-conferencing system and not spend all that time commuting every month; a lot of money also would have been saved. Second, the travel together gave us an opportunity to interact quietly with one another at least once a month for four hours without telephone calls and/or normal office hassles. This also gave us an opportunity to meet our bosses physically at headquarters and get their body signals about our performance and plans. We always felt that a good mixture of travel technology and human interaction was essential for good corporate communication and coordination. In other words, conferencing technology was required; but travelling once a month to headquarters to interact physically was also important.

Transportation has also created a large tourism industry with considerable impact on various cultures. Transportation and tourism have been able to bring together the old and the new, the far and the near, the exposed and the unexposed, the rich and the poor, the east and the west in a very special way.

It may appear that the technologies related to transport have reached a limit and may not go any further. However, there are many potential breakthroughs in the pipeline which may change the course of transport and travel in the next century. Many new exciting technologies are being developed for faster, safer and more enjoyable air travel. The developments related to space travel, shuttle and probe are equally exciting and useful. The prospects of travelling in space, making drugs at zero gravity, analysing new materials in space and repairing and recovering old satellites are some of the potential benefits of exploring space vehicle technologies. There are many interesting programmes related to exploring our galaxy and far-away stars which will keep scientists busy for generations to come.

Technology does not solve all problems. It helps in minimizing some problems but may create others. One could say that the same sophisticated technology that has cut down travelling distance has also resulted in thousands of accidents and deaths all over the world. No doubt there are problems with the machines we travel in. When I travel by plane, I get nervous if the flight is bumpy and choppy. Then I remember all the bad experiences and accidents. With the amount of travelling I used to do I had my share of engine failures, lightning strikes, fire on the plane and wheels falling off and several emergency landings. In spite of these, I keep travelling because the best way to travel today is still the jet way. If we were to avoid air travel, our interactions and activities would go down considerably and it would have a major impact on our business, profession and profits.

Entertainment: After World War II, entertainment technology exploded with the radio revolution which was fuelled by the invention of the transistor. With the transistor it was possible to build inexpensive portable pocket radios to receive signals from all over the world. This exposed people to a variety of cultures and thoughts from different parts of the globe. Radio revolution to some extent equalized society by allowing the poor man in the slum to listen to the same

news and the same music even from Beethoven, which was earlier the privilege of only the rich urban elite. Thereafter, television brought sound images from all over the world to everyone's home. Here also transistors played an important role in improving reliability, and reducing prices and physical sizes considerably. After a small span of black and white television, colour television brought a whole new dimension to live pictures. Added to this was the video revolution. Now, it is common to see video parlours, video rentals and many other entrepreneurial activities mushrooming everywhere.

Television has brought a magic screen into everyone's home for watching world events day in and day out. It is said that the demonstrations at the Tiananmen Square in China could not be controlled without violence mainly because information going through the fax machines and the BBC television news broadcasts could not be blocked. Entertainment technology has also created a major music industry with fancy stereo sounds and a craze for Western pop music even in socialist and developing nations.

Entertainment industry has also exposed people through advertising to goods and services they were not aware of earlier. This has increased their desire for pleasure and comfort. For example, in developing nations people living in slums who have hardly enough to eat now have access to television for watching programmes like everybody else. They see promotion of fast foods, soaps, shampoos, perfumes, etc., and wish they could also afford to have all these things. Their horizon all of a sudden gets broadened and they are no longer satisfied with the basic human needs. They also want things that others seem to enjoy. For them getting basic minimum needs like water, education, food, health and housing is not good enough. They now want the bells and whistles, the frills and fancies which go with modern life. There is no way to keep them away from the allure of these products and services which others seem to enjoy. Unfortunately, this creates its own problems and frustrations.

Entertainment technology has opened the minds of millions and exposed them to various cultures. Because of television, it is now easy for people to see tribal dances on the one hand and major disasters on the other. New entertainment technology has taken control away from the central authority in totalitarian regimes. Now, with a variety of programmes, it is possible to network entertainment with other messages. The power of this technology has been the key to the recent explosion of freedom in Eastern Europe. For example, in spite of the tight controls and censorship, East Germans had been watching West German television programmes for decades. The Berlin Wall was successful in physically isolating them. But the television programmes effectively kept them together emotionally and culturally.

Image Processing: Image processing technology has been used for centuries by great painters and sculptors who had the patience to carve images on stones and paint portraits or landscapes on cloth and canvas. These carved manuscripts, until printing was developed, became the basis of the belief of millions of

Christians, Muslims, Jews, Hindus and others. Once the printing technology related to paper, ink, metal plates, press, etc. came into existence image processing went through a mechanical revolution. Though it took a long time to develop these concepts, printing spread throughout Europe with unprecedented speed and enormous consequences to spread the knowledge of texts, graphics and images. This early image processing revolution helped spread literacy, expand education and develop democratic norms because through the print medium the general public became aware of the decisions reached by their rulers. The curiosity to know more about their environment and the surroundings, created further pressures on the education of democratic institutions.

Printing technology remained at work until the introduction of the camera some 300 years ago which needed chemical technology for image processing. With photography it was possible to capture real life images on plates which could be printed, preserved, multiplied and transported. Photography, even in its black and white form, flourished the world over as a major industry for almost three centuries. It touched the lives of many—rich and poor, old and young, individuals and groups. It brought the world community a bit closer with pictures of various personalities, leaders, nobility, churches, communities, etc. In those days cameras were a complicated and cumbersome affair. Then came colour photography to bring red cheeks and green grass in real life colours to everyone. The technique of combining chemicals to mix red, yellow and blue colours to provide a variety of combinations was significant in developing colour photography. With the Polaroid camera it is now possible to have instant colour pictures develop right in front of your eyes. I remember how the power of Polaroid cameras struck the people with awe and amazement, when we were visiting China as part of a US delegation during 1981. A friend, Paul, had a trunk full of Polaroid films, and two cameras. Whenever he had an opportunity to interact with the curious Chinese crowds, he would take a picture of them and give it to them to let them watch it develop. It was fascinating to see the expressions on their faces. They could not conceive that something like this was possible.

Early one morning, in Nanking, a bright seven-year-old boy, with big eyes, came running to watch us foreigners talking among ourselves, on the street. Paul took a snapshot of the young fellow and handed it to him. The boy saw the picture develop right in front of his eyes and was frightened. He knew that it was not a mirror but then what was it? He ran screaming into a street corner, probably to his parents. I can imagine him telling his parents about having seen his picture develop right in front of his eyes. I can also imagine his parents wondering about his experience with this magic.

The motion picture industry has been a major contributor to the image processing revolution. It gave meaning to moving pictures and has helped communicate customs, costumes, cultures and concerns of communities and nations. For almost one hundred years, this industry has been able to take literature, history, events, stories, etc. in the form of hit movies to the common man in vari-

ous parts of the world.

A far more momentous change in image processing came when electronics entered the world market. With electronics, it was possible not only to capture images electronically with their movement but it was also possible to transmit images, instantly, long distances all over the world with great resolution and accuracy. Image processing with electronics gave birth to the television industry, which is playing a major role in communicating messages straight into the homes of people all over the world.

Earlier, television was used as a medium just to broadcast messages from one point to many. It was then felt that television could be used as a tool by authoritarian regimes for propaganda. Today, with a wide network of television stations and studios it is almost impossible to have a single-point control of news, messages and information. With networking, television has become a tool for democratization. When people under authoritarian regimes get to see the benefits of democracy and freedom of speech elsewhere in the world, they also want similar flexibility and associated standards of living in their own country.

Along with television, the technology related to video recorders and players added a new dimension to information and entertainment. Now, it was possible to store and replay programmes of interest at one's convenience. There was no need to follow the network timings. One could even watch one programme and record another for later viewing. Through this flexibility, video recorders added another node on the TV network. In the US, there is a very large cable television industry which wires community to pump, along with national television programmes, a large collection of special programmes of interest to suit one's taste. It is not unusual in a metropolitan city like Chicago, New York or Los Angeles to have over 50 different television channels with 50 different programmes running simultaneously to cover sports, 24 hour news, classical music, pop music, soap opera, business news, wild life, environment and many other varieties. The programming on television at times is so creative and innovative that it holds its audiences spellbound for months and years, through long serials. Many serials on US television, such as Dallas, Star Trek, Dynasty, Fugitive, etc., are discussed at cocktail parties and office cafeterias. People get involved and wrapped up in television characters and personalities.

With computers, microprocessors, transputers, signal processors and associated graphics software packages, animation and graphics can be added to make programming even more interesting. Television has also created, together with special programmes, recordings on towering personalities who have great public appeal. Some of them earn millions of dollars by appearing on television for half an hour a day or even less. Personalities like Johnny Carson, Barbara Walters, Peter Jennings and Dan Rather make news every time they negotiate a new deal. TV reporting is indeed a highly specialized and competitive business and demands special skills.

The investment in software, required to prepare good programmes, is normally very large. The talent required is equally precious and limited. As a result

good programmes are limited and hard to come by. Some are shown all over the world for years. For example, 'I Love Lucy', a comedy programme which was a hit in the 1950s and 1960s in the US, was shown in many developing countries in the 1980s. The popularity of Western programmes has its own impact on the values and cultures of developing nations. Popular Western television programmes have been responsible for bringing many Western values to many developing nations in Asia Pacific, the Middle East and South America.

The recent events in Europe, specially the bringing down of the infamous Berlin Wall, were seen by everyone all over the world at the same time. The Berlin Wall came crumbling down in everyone's drawing room. The mass of people demanding democracy, and the resignation of the Rumanian leader, were also seen by millions. The television coverage of the massacres at Tiananmen Square in Beijing, the demolition of the Berlin Wall, the turmoil in Budapest and the demonstrations in Russia was able to build a certain tempo and rhythm for the rise of democracy and explosion of freedom.

This is one side of the image processing industry. The other side relates to highly complex tools and techniques for satellite imagery, computer-aided designs, computer-aided manufacture, artificial intelligence etc. Now, it is possible to take a picture from a satellite 22,500 kilometres away and pinpoint minute details on an area as small as one square metre. Through computer technology and digital image processing, we can reconstruct pictures sent from Mars and other planets to great accuracy. With computers, it is even possible to manipulate picture details dot by dot to change colours, contours and content. Image processing has indeed come a long way from stone carved images to satellite pictures, computerized animation and high resolution image processing. In the near future, it will be possible to hang high definition flat screen televisions like a painting on the drawing room wall to act as a window to world events.

Consumer Products: In the last 50 years, consumer technologies have advanced significantly for mass merchandizing of many products and services like ready made clothing, perfumes, processed foods, jewellery, shoes, cosmetics, utensils, appliances, etc. to increase human comforts, leisure and self-indulgence. It is now possible for average middle class people to pamper themselves and use products which, not too long ago, were available only to the rich. Many consumer products like blenders, juicers, washers, and dryers have modernized average households and given more time and comfort to housewives. Because of these gadgets, the women work force increased in the West. Technology had to fulfil these demands and provide relief from household drudgery to meet increasing requirements for women work force in the western world.

Mass production and mass merchandizing of consumer products have created a major global market. This has also integrated and standardized customer preferences, demands and product styles. For example, Western jeans are now being worn almost everywhere by the younger generation. Patented brand name soaps and shampoos are becoming common even in developing nations.

Some consumer product technologies have roots in defence research. Take calculators. Mechanical calculators of the early 1960s quickly got converted with transistor circuitry to electronics. But they were still bulky and expensive. Finally, hand-held calculators were available for engineering and scientific applications, initially at about several hundred dollars a piece. It was considered a revolution then. Because of large-scale advances made in semi-conductor electronics and solar cells, pocket-size calculators no bigger than a visiting card are now available for less than five dollars. These are basically throw-away items being given as gifts and toys. This was possible only because the technology to miniaturize devices for defence could be applied to consumer products.

There are many other technologies related to agriculture, housing, health, clothing, etc., which are necessary for development. Most of these technologies are aimed at reducing cost, power, size, etc., and improving standards of living and increasing comforts. The rate of technological progress does more to determine an industrialized nation's growth than the size of investment, infrastructure or labour force. Having realized this, many developing nations focus on funding technology development as a major input to overall modernization programmes.

Innovations

Innovation is the process of creating new products, new services and new ways of reducing cost, increasing markets and improving quality. It has become the key to survival and success for many corporations the world over. Innovations are needed to continue to bring new ideas and new markets to keep factories humming with activity and profits flowing in. In the free world markets, it is difficult to flourish without an innovation culture at the corporate R&D facilities.

Innovations come from freedom to think, express, experiment and explore. In a rigid structure and restricted environment it is difficult, if not impossible, to invent. Innovators are a different breed of people. They are normally free birds, outspoken, unconventional, open, committed and curious. They are risk takers and are not afraid to experiment and fail.

Innovation is a complicated process, and is essentially a result of the marriage between what is needed and what is feasible and possible, in time, to take it to the market-place. Some innovations take very little time while others take years to develop and use up millions of dollars before going to the market-place. Modern technology has reduced the life cycle of a product substantially. What is popular in the market-place today may get replaced, with minor modifications, in a short span of time. Most innovative products come from environments which are conducive to change and new way of doing things. It is the cultural background and entrepreneurial spirit in individuals and society that breeds innovation. This is seen, for example, in the United States, which has been leading in major technology innovations and breakthroughs. The US may

have had some shortcomings in commercializing some of its innovations, but innovation has had a very high profile in the US business environment. Whether it is scotch tape, microprocessor, fibre optics, lasers, health foods, software or tissue culture, the US has always been providing leadership, mainly because of the commitment to change and willingness to take risk.

Inventions may be small or big. Some are successful, others are total failures. Thomas Edison was one of the greatest inventors of our time. He patented 1,300 inventions, a record no other inventor has ever approached. Continuously for four years he obtained one patent every five days. In 1876 he set up his first industrial research laboratory which eventually had 80 scientists working with him. In 1877 he improved the telephone invented by Graham Bell. He also invented the phonograph and finally the electric bulb.

Some inventions are very simple while others are fairly complicated. For example, the Hula Hoop, a simple circular ring to wrap around your body for gyration and gymnastics, became a hit after it was invented in the 1950s and created a multi-million dollar market.

There are inventors who set new trends in science, mathematics, medicine, etc., and are awarded the Nobel Prize for exploring new frontiers of knowledge in physics, chemistry, bio-technology, genetics, etc. These big inventions and discoveries require many little inventions to convert concepts into new products and services to explore new markets. It is for these little marketable merchandise and modifications that we need free enterprise and open communication systems without many constraints to start a business and sell products. If proper infrastructure and environment is not provided by the government it is difficult to breed innovation. The results show that very few product innovations have come from socialist and/or developing nations. The drive for innovation in pervasive consumer products has come only from the USA and Japan and a few European nations.

Having been part of the technology revolution in telecom in the US, I have had several interesting experiences with innovation which confirm my belief in the power of free enterprise system to respond and react to new ideas. These few examples from my own experiences describe how entrepreneurship and innovations blend together to create new products and open new markets.

During the early 1970s, I once had invited a friend to dinner at 7.30 p.m. I wrote this appointment in my black diary which I have maintained meticulously for the last 25 years. I always say that once it goes in my diary consider it as done. Well, not quite! That evening I had my dinner early at 7.00 and at 7.30 my friend showed up. I was a bit surprised to see him without an appointment. After a quick chat I asked, 'What brings you here?' His response was: 'What do you mean? You have invited me for dinner. You wrote it in your diary.' Then I realized that I had forgotten to read the appointment in my diary. I finally had to eat another meal with him—two dinners in two hours! It was not a comforting experience.

That night in bed I wondered that if I had a diary that could read for me and

remind me in advance I would not be in the situation I was in. The problem kept revolving in my mind for a few days. I saw a need and a market for it. The logic was that if I could use one, others would want one too. Within a week I decided to design an electronic diary with discreet logic circuits, beeper and a key pad to input appointments based on daily schedule and automatically recall it when needed. In the early 1970s microprocessors were not very common and a lot of discreet logic circuits had to be used to develop this invention.

Having designed an 'Electronic Diary' it was time to protect the idea by filing a patent. I contacted a lawyer friend who was also an electrical engineer and who had earlier helped in filing my telecom patents. He was intrigued by this little non-telecom invention. We sat together for hours and wrote the case and necessary claims needed to file a patent with the US patent office. As usual, it took over a year to receive the final patent certificate and award. Finally, I did get a patent on the Electronic Diary but nothing happened thereafter.

I was busy with the more exciting telecom revolution where more complex problems needed to be solved. I knew that there was a large market potential for the Electronic Diary, but had no time or money to invest. One morning along with my American Express bill I received a brochure on something similar to my Electronic Diary. I sat up and said, 'Yes, that looks like my patent—I must go after them.' I tried to contact them, but nothing much materialized. Apparently it did not sell well because the size of the diary was too large, suitable for desktop application, rather than pocket size. After a year, I saw an advertisement in a local Chicago newspaper for a pocket size version of an electronic diary by the Toshiba Corporation of Japan. This time it was an identical product and I decided to go after them. After a year of negotiations with lawyers on both sides I received a cheque for US $ 50,000 for patent infringement and initial royalty. Today after almost 17 years from the date of issue of the patent, millions of electronic diaries are floating around the world. Unfortunately, I have not had the time, energy, and the resources to recover royalties.

I developed the Electronic Diary because I saw a problem that needed to be solved. It was more for a kick than a business endeavour. This was possible and profitable mainly because there were no basic barriers to experiment and innovate. And there was patent protection for new ideas and products. During the whole process I had to interact only with one person, namely my lawyer. There was no bureaucracy asking questions, demanding forms, or creating bottlenecks. During the whole process I felt like a free bird in a free enterprise system motivated only by potential markets and not necessarily by money or profits.

Another instance. Several years ago, we were playing bridge with friends in the basement of my house in Downers Grove, Illinois. Whenever we played cards, my son, then eight, helped with the drinks. While we were busy bidding, I quietly asked him, 'How come you don't play cards?' His response was, 'I don't like cards because cards are decimal and feudal.' This eight year old was just getting into computers. He had his Radioshack-TRS 80 and was learning binary numbers. He thought everything decimal was antiquated and old.

I had been playing cards for over three decades. In spite of my formal education and expertise in computer science I never realized that cards were decimal and indeed feudal with the Jacks, Queens and Kings. My son's comment hit me like a rock on the head. After the game, when I had recovered from the shock I went out with my son to buy half a dozen decks of cards, masking tape, glue and a pair of scissors and decided to design a new deck of cards. To me it was a game that I wanted to play with my son. Next day we went to the library together and collected some books on playing cards. To my surprise, I learnt that the cards we play had not changed for 650 years. Because of ten decimal numbers, three feudal characters and four suits relating to four seasons, there are always 52 cards in a deck. All the machinery to manufacture cards all over the world is designed to handle only 52 cards plus two jokers.

After a little homework, we decided to design a new deck of playing cards with binary numbers aimed especially at the growing population of young computer users. These cards were to be different from traditional ones. They used base 2, binary values (1, 2, 4, 8, etc.) as opposed to decimal values (1, 2, 3, ... 10, etc.). The Queen, King and Joker were replaced by computer, programmer and software bug. To our surprise, almost all the known card games could be played with the new binary cards.

Once again, I did not pay much attention to this product concept, because after inventing, our game was over. My son got busy with his homework and school and I got busy with my telecom technology and work. One day I was having some business discussion with my lawyer on the eighty-first floor of the Seers Tower. I briefly mentioned my binary card games. He shot up in his chair and said, 'Sam, you are not leaving this office until I make some arrangement to file copyright not only in the US but in some European and Asian nations as well.' He instantly organized with one of his colleagues the necessary paper work for filing of copyright. This ultimately led to a small company called 'Compucards' in the US, to sell through mail order business binary decks of cards. This innovation received a fair amount of publicity in the US media, mainly because someone after 650 years had finally decided to change the deck of traditional playing cards.

The point here is that innovations come from all sorts of ideas, actions, comments, functions, and facilities. Just a little unusual comment from a small child can also trigger a whole new thought process. But this is possible only when we are accustomed to thinking aloud about new ways of doing things and are willing to experiment and change. Children, with their fresh minds, full of curiosity and without inhibition are great at triggering innovations. Add to this the market for their goods and services ranging from toys to diapers, which is a multi-billion dollar industry, always looking for new avenues to expand.

In the US, I used to talk at the local schools about innovations with children in the age group of 8 to 12 years. I would also take with me some of my innovations for them to feel and touch. It used to be an interesting learning experience, more so for me than for the children. Every time I gave a presentation on

innovation, I received at least a dozen letters from children expressing their craving for creativity. Once a boy of 10 wrote that he wanted me to verify an invention of his, which he had created to solve a peculiar problem of his. He said that he had a cat which always got more attention in his house than he. When his father came back from work the first thing he would ask: 'How is your cat? Did you feed him? What did you feed him? Did he eat? When did you feed him?' etc. So did his mother when she returned from work. The boy felt that he did not get enough attention from his parents. And the only way to solve this problem was to invent an automatic cat-feeding machine with a timer. He had made elaborately sketched his idea and described it. If it worked, he could tell his parents to check with the machine for cat-feeding questions. He was ready to tell his parents: 'Will you please ask about me and how I am? What I ate—and not bother about the cat?'

This problem solving attitude and approach has to be taught early in life, for us to be responsive to new products. I believe freedom of expression and freedom of thought comes from other freedoms in society. In a feudal, hierarchical and bureaucratic system, with many gatekeepers around it, it is difficult, if not impossible, to breed innovations. Innovation has also a lot to do with child rearing practices. When children are constantly told what to do and what not to do, what to eat and what not to eat, when to play and when not to play, with a lot of supervision, control and regimentation, they tend to avoid exploring new frontiers. They understand that the rules of the game are normally set by elders in society, and they, as children, have very little opportunity to change these rules. As a result they derive comfort in status quo and learn to live with the past and the present without worrying too much about future prospects.

Innovations come more from individuals than from large institutions and infrastructure. Big monolithic institutions do spend more money for research and development but do not quite deliver successful and useful innovations. In fact, large companies seek to break their organizations into small groups to encourage innovations. Some companies are specially structured to welcome new ideas and keep the creative spirit alive. The 3M company of Minnesota is one of the rare innovative conglomerates with sales in excess of $12 billion that keeps new ideas and innovations flowing into its laboratories and small meeting rooms. It provides innovation culture and work environment for its engineers and scientists to participate with its customers in developing new products. Its management is tolerant and constructive enough to accept mistakes and encourage initiatives. Typically, at 3M, a new product idea is developed and action team is formed, by recruiting members from technical, marketing, finance and other disciplines. The team then designs the final product and works out a way to promote and market it. It is encouraged to nurture an idea until it becomes a viable small business. With this approach, 3M created a multi-billion dollar corporation on products like simple scotch tape, post it stickers, and connectors.

In the corporate world, to breed innovations we require encouragement, incentives, team work, leadership, profit sharing, competitiveness, and many other

creative concepts to enlist participation from all. The key to innovation is willingness to change, tolerance to failure, high level of motivation, understanding of the markets and customer needs, sharing of knowledge and an open mind. Most innovations that I know of, have come from free enterprise and people with entrepreneurial instincts. The US and Japan have been the envy of world innovators. The US has a long history of innovations and Japan is a comparatively new entrant to this game. Even today, US products are admired all over the world, whether in electronics, health care, software, computers, construction, cosmetics or communications.

Innovation is not just confined to products. Billions of dollars have been saved and made with innovations in administration, manufacture, marketing, distribution and finance. Manufacturing innovations eliminate unnecessary parts, reduce labour costs, increase reliability, automate production lines, improve serviceability and provide enormous competitive advantages. New concepts in manufacture such as 'just in time' to organize materials and coordinate supplies are known to reduce inventory levels by 10 per cent. In some large corporations this has resulted in savings of billions of dollars every year. Similar innovations in distribution and marketing created a whole new enterprise for AVON products. The concept was to employ housewives and other women part time for selling and distribution of cosmetic products. This innovation reduced overheads, eliminated full-time staff, and encouraged thousands of female entrepreneurs to sell AVON products, on commission.

Without innovation, a society cannot be dynamic. Innovation is the fuel that helps a society's forward movement, the factor that assures improved products and services for tomorrow. But innovation needs people with open minds and willingness to change.

Management

Management, which as an institution is only about one hundred years old, requires the ability to put people together with different skills, backgrounds, education, knowledge, values, experiences, expectations, aspirations, cultures, nationalities, social status, perceptions, priorities, biases, etc., to achieve common goals. Management demands special skills to organize, mobilize, and motivate people. It also requires the ability to communicate, coordinate, command, control, comfort and lead. Management relates to optimizing resources such as manpower, money, manufacture, materials and markets. In other words, management is simply performance, and the manager's role is to perform. Management is a very complex discipline because it deals with many social, economic and cultural variables to optimize perceived values. It appears simple, as long as someone else is performing and practising it. It is like a smooth swimmer who is quite comfortable and without splashing water just keeps moving ahead.

Since management constantly deals with human beings who make things happen, it is deeply embedded in culture. Management cannot be preached or prac-

tised in words but has to be reflected in attitude, approaches and action. As technology has changed drastically in the last century our management has also changed accordingly, perhaps at the same pace. However, the pace of change in management is hardly noticed compared with the pace of change in technology.

Technology, culture and management are three sides of the business/organizational triangle—closely interdependent and interwoven. If management cannot cope with the development in technology and culture it cannot deliver performance. Similarly, if culture cannot cope with technology and management, it cannot translate technology to deliver benefits to people. In a complex and diverse cultural environment, management becomes very difficult and challenging because commonly shared values and goals are difficult to arrive at. For any organization to be successful, the overall objectives have to be common, clear, simple, measurable and deliverable. In a large organization these unifying objectives need to be communicated loud and clear, time and time again, to all concerned to focus their attention, effort and energy.

In the early days, more than a hundred years ago, most of the technology and business transactions were simple and were handled by one or two key persons. Most of them were owners or their immediate family members. There was no need to put together knowledge and skills of others to organize talent for common goals except perhaps in the army, where these skills were needed to organize troops. It was only after the modern industrial revolution of the nineteenth century that management, manager and work hierarchy became an essential part of the organization and business. During the European industrial revolution, work became more complex and had to be divided into various groups. This gave rise to a system of distributing work to various groups of specialists such as engineers and accountants to manage these activities with command and control at the top.

Even now, in many traditional business houses it is assumed that people at the top have all the required knowledge to operate profitable business and those at the bottom are there just to take orders. It is only in the last 50 years that businesses have been slowly turned over to professional managers for day-to-day operation with stockholders and board of directors to give overall strategic directions. With more and more knowledge, workers in the organization, now managers, are beginning to recognize that their role has to change from command and control at the top to coordination and communication with the bottom. With knowledge well spread out at the bottom of the organization, the new management has to focus more on creating new work environment and new work culture designed to suit the knowledge base by networking people and information.

In the US, over 50 per cent of the people work in offices with information and knowledge. Over two-thirds of the work force are qualified as professionals and managers. In the last decade a variety of new office equipment, such as desk-top computers, word processors, fax, copying machines, electronic mail, voice mail have been introduced to increase their productivity and efficiency.

With more information, traditional work hierarchies and associated multiple levels and pyramid structures are being replaced with more flat organization to network people for improved coordination and reduced control.

Today's business environment, which is uncertain and ever changing, demands innovations, entrepreneurship and a lot of hard work to manage change. Management's ability to respond to change determines its ability to succeed in a competitive market-place and deliver performance to its stockholders. But change is difficult to recognize and appreciate. Change involves unknown risks which not many tend to venture in. The unknown element of change makes management a science waiting to explore new frontiers. However, management also deals with the application of discreet, manageable and measurable resources which make it a technology.

But management mostly deals with people, their values, priorities, perceptions and promotions. That makes management a social science. Management means many things to many people, depending upon—What are you managing? Why are you managing? How are you managing? Who are you managing it for? What are the variables? What do you want to optimize? etc. To me management is an art, science and technology rolled into one, because it deals with the abstract, the unknown and the absolute. To me, it is also a way of life, which depends upon many social, cultural and economic experiences and expectations.

The key to good management is good leadership. Leadership implies a person's capacity to move and inspire a large number of people to act together in the pursuit of an end. The concept of leadership implies that each person is important and can make a big difference in achieving objectives. The entire world is moved by a handful of key persons. The rest just follow and go along as the wind blows. Human history has been guided by a few individual contributors such as Newton, Roosevelt, Gandhi and Martin Luther King. These men were drivers in their own field and were committed to the cause which, in many ways, had an impact on the lives of millions and in the process changed the course of history. A good leader is capable of formulating a vision of the future which relates to the way things ought to be compared with what they are. He must be equally capable of communicating and selling his vision to a large number of people in the organization who are responsible for implementing it. Finally, the leader should be able to break his vision in small manageable packets of work to be performed by others. In order to translate these larger goals in the corporate world there are effective tools like strategic business plans (SBP), annual operating plans (AOP), programme management, project evaluation and review technique (PERT), monitoring, etc., which a leader must learn to use.

In the Western world, good managers are recognized and rewarded handsomely. The chief executive of a large multinational conglomerate is paid several million dollars per year in salaries and incentives. Even middle level managers are paid hundreds of thousands of dollars per year. In the free enterprise system of the West, each is paid according to his or her ability, utility and expertise. As a result, there is considerable mobility and competition in the job

market. Executive search is a multimillion-dollar business with several large companies having offices all over the world. They keep constant watch for special management skills and put deals together, to match supply and demand, in return for hefty commissions.

In the large modern industrial environment, the overall corporate objectives are divided into various tasks and sub-tasks related to design, development, prototype, production, quality control, purchasing, accounting, marketing, sales promotion, costing, and training. People are assigned to perform these tasks within an allocated time, funds and other resources. To coordinate this effort, a team of managers, with a leader, is required with appropriate strategy and methodology. The management of these tasks implies basic concern for productivity, efficiency, cost reduction, quality and a commitment to people working together. It also involves rigorous training and discipline to review periodically individual and collective performance for corrective action. For this, motivation has to come from within, to perform and deliver.

Good management is essential for survival in today's highly competitive business environment. Those who cannot manage effectively and cannot respond to change, normally cannot remain profitable. They invariably reach bankruptcy court or are bought out by more successful managers. Without good management it is difficult to promote the innovations necessary to bring new products and new services to the ever-changing market-place. Efficient management is also required to integrate resources from the world over, so that the best cost-effective input for labour and material is selected, from wherever feasible, to improve profits.

It is the task of management to manage information and knowledge in the organization related to various products, processes, people and markets to generate profits. Modern management is a product of developed nations and their ever growing knowledge base and global enterprises. Their expertise is difficult to develop. All socialist nations will have a difficult time in developing the key managers needed to transform their economies from centrally planned to free markets.

In developing nations, people hardly recognize or appreciate good managers and good management. There, everything is highly politicized and as a result patronage, perks and privileges overshadow performance. Most developing nations are poorly managed with unnecessary controls and lots of confusion about national programmes and priorities. Good management is needed to ensure good utilization of scarce resources, specially in developing nations. But good foreign managers are culturally unfit and do not appreciate local 'pushes and pulls', while the local managers do not have the opportunity or exposure to good management practices that can be transplanted successfully. Because of antiquated financial and personnel policies good management with autonomy, flexibility, and responsibility is difficult to achieve in developing societies. If achieved, it may get easily trapped in cultural conflicts.

Similarly, in socialist nations, management is not in tune with the globaliza-

tion of markets and economies. The procedures adopted in a closed system with limited opportunities, quotas and rigidity do not allow managers the freedom and flexibility to explore and expand. As a result, over a period of time a mind set is developed which cannot operate beyond certain artificial boundaries and barriers. In my interactions with Soviet managers, I find that their view of what is possible and feasible is very limited. Their vision of business opportunity is narrow and unclear. Their approach to value engineering, cost reduction, competitiveness, productivity, efficiency, and quality is non-existent. Their management methods must be seen as part of their government priorities, policies and programmes. They will take a long time to change.

The management of technology and business also relates to institution building for research, development, education, training, testing, legal matters, and many other related activities. Take consumer technology and products which lead to creating consumer protection act and an independent institution like the Underwriters Laboratory (UL) in the US to test and certify consumer products of all kinds. Similarly, significant progress has been evident in the management of financial institutions in the US and Europe in the last decade. Besides new financial instruments, electronic fund transfer and computerization of stock markets have created networking of financial management systems to move money at electronic speed. This has given rise to cashless business transactions world wide and increased circulation of savings to create new opportunities and new assets.

In my judgement, the greatest success of the American system is its management enterprise which has constantly responded to change. America has always been a melting pot of nationalities from all over the world with varying values and aspirations. In spite of this, American institutions have been able to integrate all aspirations with common goals and thriving prosperity for decades. America provides one of the highest standards of living with unlimited opportunities for a person having knowledge and skills. It has attracted the best talent from all over the world. Contrary to the widespread belief, America is not a materialistic society. It has an idealist outlook and a concern for the social cause and services. In American institutions knowledge and justice are ranked above power and wealth. Technology and management are seen at the everyday level at grocery stores, shopping centres, homes, libraries, hospitals and football fields. The management culture at work is reflected in openness and a positive attitude to life. People appreciate and enjoy life with optimism, friendliness, courtesy, confidence and community concern. Americans believe more in the future than in the past. To them the glass is always half-full rather than half-empty. This approach has a lot to do with American institutions, achievements and marvels of management.

Similarly, the Japanese style of management with emphasis on lifelong corporate service, quality circles, team-work, and concern for details has made Japan a major economic power in the last two decades. However, this required considerable technology input, financial investments and support from the

Americans not only during the early stages of reconstruction after the world war but also for continuous access to their large markets for electronic goods and automobiles. Through hard work and quality goods the Japanese have been able to capture a substantial share of the American market. They have also been equally successful in penetrating other markets in Asia, Africa, the Middle East, and South America. Japanese success and prosperity are beginning to have an impact on their culture and family life. Western, more particularly American, influence is now evident on television programmes and promotions, fashion, fast food chains and other business environments such as corporate golf games. The young Japanese, in many ways, are closer to the American lifestyle than their own. American technology, products and markets which gave Japan the initial boost are bound to have an impact on its youth and culture.

The major challenge to management today is from the information revolution which is spreading rapidly everywhere. The information processing at electronic speed with integrated computers and communication facilities will demand new work methods, new work culture and new work habits. In an information oriented work place, young people with knowledge will be in the driver's seat as opposed to the experienced senior staff. This technology, along with its new tools for automation, robotics, design, and analysis, will change our potential capabilities manifold overnight. The unthinkable will become a reality, with powerful desktop super computers. This will have far-reaching implications for management. Corporations and nations which can cope with these changes will be the leaders of tomorrow. Tomorrow belongs to those who can cope with the change in management methods resulting from the coming information revolution.

Entrepreneurship

Over a period of time, many technology-oriented business organizations have become very large and global with their own bureaucracy and red tape, similar to many governments. Some of them are as rich and powerful as any small nation. They employ hundreds of thousands of people and control billions of dollars in assets. In such mammoth organizations, it is difficult to innovate and operate at a pace necessary to capitalize on new technologies and opportunities.

In the last decade, specially in high technology areas, there was a sudden and successful emergence of entrepreneurs with a great deal of freedom, flexibility, autonomy and mobility to cut through the red tape and the large static systems to deliver results. Entrepreneurs by definition are a different breed who are lean and responsive. They are constantly looking for opportunities and smell business potential readily. Once they identify potential, they move in with the speed of light, and cross many barriers to mobilize consultants, professionals, financial institutions, and other organizations to come together for profits. Many entrepreneurs are more adept at starting up and creating infrastructure than running a day-to-day operation. This emergence and glorification of entrepreneurial

work, which is more of an impulse than a continuous routine task, has helped in defining and creating new opportunities.

It is well recognized that without good entrepreneurial input, some of the high technologies are difficult to develop and convert into viable products in markets for the masses. Entrepreneurship is an art, as opposed to science which can be taught at prestigious management schools. It depends on gut feeling and the ability to integrate various inputs, without a lot of facts and figures. It requires ability to get things done against all odds, to sense opportunities and select the right one to focus on, like a laser beam, with all the energy to drive it through the available time-frame to deliver a profitable package.

An entrepreneur is always dealing with forces of change and is comfortable with change. He has a sense of urgency even when there is no emergency. He specializes in taking rigidity out of the bureaucracy to move at a much faster pace than the systems around are designed to do. Most bureaucrats think only in terms of small delta change, bound to many rules and procedures which are their mainstay. Entrepreneurs think in terms of an end point and quantum changes. Entrepreneurship is a very precious commodity specially during globalization in the next decade, when many new opportunities are going to emerge.

There is a great difference between an entrepreneur, a manager, and a leader. The task of an entrepreneur is to create something new from scratch whether it is an idea related to product, organization, innovation, institution or specific project. The rate of failures among entrepreneurial programmes is high. This is mainly because the entrepreneur is always running against time to integrate all available resources to capitalize on an opportunity. Invariably he has limited financial resources and ends up bootstrapping the operation. If he were to use normal corporate methodology and procedures and go according to rules and management books, he would be more a manager than an entrepreneur. Once an entrepreneur puts something together, a manager takes over, and converts it into a viable business, with the focus on institution building and continuing profits. Once the manager builds a very large enterprise, it may become bureaucratic, lethargic, slow and at times stagnant. Transformational leaders are then needed to convert these back into dynamic, aggressive and profitable enterprises.

In other words, an entrepreneur invariably has a vision related to his programme. However, he is capable of carrying it only to a point where he has to turn it over to a manager for institutionalization and transformational leadership for restructuring and revitalizing. This is not to say that entrepreneurs cannot be managers, and managers cannot be transformational leaders. However, these three disciplines require different mind sets and it is difficult to find the three personalities in one person. Developing a vision in a small entrepreneurial business with fewer variables is quite different from developing a vision in a big organization with many variables. In a large organization the corporate vision has to be sold to many others who are ultimately responsible for implementing it.

In the Western world, specially in the US, the entrepreneurial phenomenon caught on well during the last two decades. Take Silicon Valley, the Mecca for high technology business. Here new ideas, new products, and new entrepreneurs are born every hour. Big companies here are used to losing good people for new start-ups. In this area venture- capital people are positioned like vultures to grab a good opportunity for a financial bonanza in the future. They invariably focus on a key entrepreneur or a technocrat more than on his product or process. They believe that the right individual will always come up with the right product. But the wrong individual cannot make the right product succeed. In other words, they always invest in people as opposed to products or processes. They also have systems to breed and support good entrepreneurs. They carefully take an entrepreneurial innovation and process it through an incubator, so to say, nurture it like a baby and take a lot of care in putting pieces together, before it is ready to be identified as a viable business. A lot of work has gone into understanding entrepreneurial instinct, individuals and institutions.

I had a close encounter with American entrepreneurship when we sold our company in the US. It showed how flexible the system is and how much freedom is available to individuals and institutions. We had built a company in the telephone equipment market with a turnover of close to $100 million a year. We needed more money to expand it. Since in those days initial public offer was not very common, we decided to sell our company to some large conglomerate. While we were still preparing a prospectus and having informal discussions, one morning my partner said that he had decided to sell the company to Rockwell International, a multi-billion dollar company from California.

Next day I was to have lunch at the Oak Brook Hyatt with the President of Rockwell, Telecom. He came in a 22 foot limousine with his associates. The deal he offered was not, however, attractive enough and I told him so. His response was, 'If you can get a better deal from someone else, please go ahead.' Though disturbed by this development I decided to look for a better deal. Before the talks with Rockwell we had hired Solomon Brothers, Investment Bankers from New York to prepare a prospectus and work with us in finding a deal. While preparing this document, a team of young MBAs had talked to me for over two days. From their questioning and probing I had learnt about what to highlight in packaging an attractive deal. Packaging was as important as the balance sheet, profit and loss statements, products and markets.

The same afternoon I called a friend at Xerox Corporation. Next morning I was on a flight to Los Angeles to meet Xerox Business Development executives. I spent a whole day with them explaining our company, products, market and potential growth. I told them that I was looking for a better deal than Rockwell had offered. The Xerox executives were fairly impressed and decided to meet at their Connecticut headquarters next week.

We had to configure a deal quickly because our agreement with Rockwell was to expire in 30 days. On my way to Xerox headquarters I was having a drink at the O'Hare Airport bar with a friend, and a gentleman sitting next to

me said, 'Are you Sam Pitroda?' I said, 'Yes'. He said, 'I have seen your pictures in telecom magazines. How is your company doing?' My response was, 'Not very well. We are ready to sell and we need more money to move forward.' He asked, 'How much?' I said, 'At least $20 to 30 million.' He said, 'I am from Saudi Arabia. Here is my card and I will contact you next week.' I did not take his offer seriously. However, within a week I received a call from Saudi Arabia saying that some Saudi prince had decided to invest $30 million in our company. Next day I called back Saudi Arabia to make sure that the telephone number and the person I met at the airport existed. When connected, I was told that we could have a meeting in London the following Monday with the principals.

In London we were met by two highly impressive and talented executives. One had a Ph.D. Based on our preliminary discussions it was decided that a team would visit Chicago the following week to finalize the memorandum of understanding for an investment of 20 to 30 million dollars in our company with equity participation. At the Chicago meeting, quickly, after assessing our products and potential and brief conversation with the partners, the team drafted an agreement and simultaneously announced the break of our contract with Rockwell. The news caused quite a deal of commotion and confusion with our customers and employees. We had to have a series of meetings to inform everybody that we were getting a better deal and this was in the larger interests of the company.

The agreement was open for 30 days. The initial excitement, however, wore out soon. There seemed to be something fishy. We had a hard time getting them on the telephone and our messages were not returned. Since they were relying on El Saudi bank in Paris, I decided to check out with the bank.

I spent three days in Paris with the representative of the investors and came to the conclusion that they were looking for a real estate deal and not a technology-based enterprise. They did not quite understand the complexity of our technology and the competitive market-place in telecom. They were afraid to plunge into it without a large real estate to back it up. Meanwhile, my wife was getting a series of frantic calls from Solomon Brothers and others asking about my whereabouts. In their judgement what I was trying to do was not proper and I was chasing rainbows. We had lost a lot of ground in the meantime.

Back in Chicago, I called the Chairman of Honeywell, a computer company from Minnesota. We had been having some talks with them, which facilitated matters. Within a couple of days the Honeywell Chairman with his corporate staff came to our facility at Downers Grove, Illinois, in a private jet. His approach was simple. He recognized the potential of switching technology and wanted to make a deal first with me and then with the partners. Having agreed to the basic formula in Chicago we were invited to visit Honeywell headquarters for a day, to meet their executives and see their research facilities. It was indeed a good match. Within a few days we made a deal with Honeywell to sell our company lock, stock and barrel.

When the news appeared in the *Wall Street Journal* next morning we received a phone call from Rockwell. It appeared to us that Rockwell was interested in rebidding. Finally one late evening we received a call from the President of Rockwell who said, 'I am still interested in making a deal with you. Just tell me what is the final price. I don't like your going to various companies to sell the deal.' We gave him the final price and he agreed on the phone. I asked him how quickly we could get together to finalize this. His response was, 'How quickly do you want? I can get people out to Chicago by 7 o'clock in the morning.' This meant waking his people up in the middle of the night. Next morning three groups of people, from Pittsburgh, Los Angeles and Dallas flew in special corporate jets and were waiting for us at the O'Hare Airport Hotel. We worked hard for two days including Christmas eve to finalize the agreements with a large group of lawyers on both sides. Finally the deal was through. Now we were ready to get our seven and eight digit cheques within 60 days.

This is an example of the ultimate in entrepreneurship activity that goes on day in and day out in thousands of corporations in the Western world. We could do all that we did in no more than four months, because of technology to travel at jet speed and communicate instantly at the speed of light. With an American passport there was no need to worry about a visa to London, Paris, or Frankfurt. With an American Express credit card there was no need even to worry about the cash. Airline tickets were purchased at the airport with plastic cards, hotel reservations were made instantly on the phone and there were no barriers to entry anywhere. Most of the dealings were open, frank, fast and based on facts and figures available at hand. Hundreds of people were involved in making this deal. There were bankers, lawyers, owners, corporation executives, staff, investment advisers, customers, vendors, employees and family members. Everyone worked for long hours, as a team, trying to coordinate and communicate various instructions, ideas and messages originating sometimes at random from a variety of places.

After we made the money and deposited the cheques in the banks, a whole new set of entrepreneurs came knocking on our doors with investment opportunities in mutual funds, municipal bonds, money markets, certificates of deposits, commodities, metals, precious coins, stocks, arts, oil and gas opportunities and a variety of tax shelters. Someone wanted me to buy 200 pigs and feed them lots of corn as tax write-off before year-end and then sell fat pigs during January with a fat profit and long-term capital gain. There were many creative ways to avoid taxes, make money and defer income. These entrepreneurs were just waiting for an opportunity to take a small piece of the pie which we had baked. To all of them motivation came from within. They were not waiting for direction from anybody else. They were not guided by orders from the bosses. They were their own men trying to explore new opportunities and new ventures. They were self-motivated and self-driven.

Though I had personally done a lot of running around against Rockwell, and was responsible for jacking up the final price significantly, once I started work-

ing with them, all that was forgotten and our relationship turned out to be one of the best I ever had. People I dealt with were highly professional who believed in performance and were not interested in personalizing earlier disagreements. I had great fun working with them. I was there just for three years as part of a management contract, but I was still considered a key player in the telecom decision making. I was given all the importance and respect at Rockwell that an executive deserves, and at times even got special preferences for personal tax planning and other matters. This speaks volumes for the professional entrepreneurs and managers who are dealing with new technology companies in the US. My fellow executives were always interested in working on the agreement we had and were willing to disregard disagreements. They were keen to build on consensus and team work because they appreciated the fact that the new technology demanded good interpersonal relationships and good communication and coordination.

Democratization

Technology has substantially quickened the pace of democratization in the last 40 years, with increased communication facilities, availability of consumer products, growth in standards, innovations and corporate spin-offs. Communication through radio and television has energized people. Through information dissemination modern communication has equalized society and democratized the system. Now even those living in the slums of Mexico City or Bombay have access to the same television programme which the rich watch in a five star hotel or their mansion. They listen to the same music, which not long ago only a few rich could listen. The improved access to information has helped in standardizing messages to promote further democratization.

The increased availability of quality consumer products at reasonable prices through mass production and mass merchandizing has made the gap between the rich and the poor less visible. Now, even ordinary people can be well dressed and well groomed at a reasonable cost. This has increased their self-esteem and self-confidence. In the advanced nations of the West the gap between the rich and the poor has narrowed substantially with a very large affluent middle class. In many Western nations, the difference in the salary of the worker and the boss is not very large. Almost everyone with a permanent job in the US and Europe can afford a home, a car, a telephone, a television, a radio, and some furniture, and enough to eat well. This has integrated communities with people from a variety of backgrounds.

When I first went to the US I was amazed to see at the campus cafeteria a group of five people with totally different backgrounds and social and professional positions eating lunch together everyday. This group included the campus doctor, the barber, the nurse, the bookstore manager and a grocery store worker. For Indian students with deep-rooted notions of caste, customs and hierarchy, this was quite an experience. Specially the doctor, the nurse and the barber, all

three with totally different social functions and social hierarchy eating together was the ultimate in equality and democratic norms. Everyone at the table was comfortable and did not bother about his or her job, designation, functions, or income potential. They were just friends, eating together and enjoying a normal conversation about football games, television programmes, local politics and house repairs. This was possible because there was little difference in their lifestyles as they were all living in the same neighbourhood, using the same products and the same services.

Similarly, in the rural and backward areas of developing nations, simple technologies such as water pump and solar power have helped in democratization and integration. In India, with its rigid caste and class structures, specially in villages, water wells have for centuries been earmarked and protected for the use only of a certain class of people. However, when the government installs a deep water hand-pump, commonly known as MARK II, for providing clean potable water, community differences are kept aside and everyone begins to use the same water source. In fact, the water pump installation becomes, for the entire village, a major activity in which all—children, women, old and young—participate. Ultimately, this location turns into a major village communication centre where all kinds of information on family planning, health services, etc. is exchanged. Pump maintenance and repairs also bring other villages and communities together on common problems of interest. Similarly, in remote towns and hilly areas, where power grid has not yet reached, solar panels for street lights and community centres bring energy and enthusiasm for everyone.

Consumer products have created major institutions and movements for consumer protection, safety, security and people's participation to demand quality products and services at reasonable prices. Consumer movements have also been a major democratizing force. For example, consumer activities related to the auto industry have brought a variety of experts together, to educate and enlighten people about various defects and hazards. Auto emission and exhaust, which have been responsible for pollution, are two major areas of public concern related to environment. Many of these activities and organizations link and network lawyers, doctors, bankers, salesmen, insurance agents, engineers, scientists, and other professionals with consumers and citizens for the common cause. The national and international standards for health, environment, safety, products, and processes have been important in harmonizing technology, trade, utility and benefits. The standards cut across national boundaries. They transcend caste, community, race and religion and thus simplify matters. They also integrate communities and concepts. Take the standards for traffic signals. The concept of red to stop, green to go and yellow to wait along with many other symbols for stop, yield, crossings etc. have had a great impact on transport systems all over the world.

Standards have the effect of harmonizing and democratizing products and services. Their objective is, on the one hand, to have the widest possible choices from a whole range of products and, on the other, to provide compatibility,

safety and connectivity to benefit consumers. With standard products, manufacturers enhance their market and benefit from the economies of scale, free competition and reduced product development costs, hopefully leading to lower prices for the consumers.

Standards involve discipline on the part of not only the technical community but also the user community and the public at large. As a result, standards bring people from various backgrounds together, to discuss common human concerns like safety and pollution. Though standards, at times, are also used to perpetuate monopoly, in general they bring about consensus in the approach and attitude of the producers as well as the users.

Technology also has contributed to democratization by distributing wealth to new technology entrepreneurs and innovators. It is generally believed that the policies in socialist nations are designed to distribute wealth more equitably, while in the capitalist nations, because of the free enterprise system, wealth gets concentrated in the hands of a few, that the rich get richer by moving their money intelligently. However, in practice, many distortions have appeared in both systems. In most socialist nations, wealth and privileges have accumulated in the hands of a few political pundits and top bureaucratic bosses. The Romanian leader built a monumental palace with gold bathroom fittings and huge chandeliers for his private use, while the public was waiting for cheaper food and more consumer products. Contrarily, in capitalist nations wealth has been distributed to a large number of people with innovations and technology.

In the capitalist system, many socialist ideas have been adopted and implemented successfully to subsidize education, health services, and social security. It appears that the capitalists have learned a lot from the socialists and adapted a great deal to bring social equality in meeting basic human needs. But very little has been learned by the socialists from Western capitalism. We know the path from capitalism to socialism, but we do not know the path from socialism to capitalism for free markets and free enterprise.

In the capitalist system of the West, the technology-millionaires have been around for decades. However, in the last 20 years their number and activity have increased substantially to make them more visible, effective and powerful. Take the invention of the transistor during the late 1940s. This simple experiment with semiconductor material to pass electric current in one direction led to the concept of new devices like diodes and transistors for amplification and automation. The invention was nothing short of a miracle for the electronics industry. It replaced almost overnight bulky glass vacuum tubes with tiny solid state components in radios and televisions.

In recognition of this invention three scientists were awarded the Nobel Prize. One of them decided to exploit the invention commercially. With his drive, and with the dedication of a team of young engineers, a whole new era was created in less than 20 years. In the first ten years there were many spin-offs from the parent company. Everyone who knew how to make semiconductor devices, had finances lined up to start a new business of his own. As a result hundreds of

new companies were started all over the world to meet the growing demand for radio, television and electronic equipment.

Today, the semiconductor market the world over is estimated to be worth $55 billion per year. For a tiny invention, made only about 40 years ago, this is quite an accomplishment. Of this $55 billion, Japan produces $29 billion and the US $20 billion worth of semiconductor devices. This market is now largely dominated by the industrial giants. However, small companies are still very active.

This is one example of how new technology has created an enormous amount of new wealth and a large number of wealthy technocrats. In this process, wealth could not be kept with a few traditionally rich families. The new rich, with new wealth, were basically explorers who kept investing their profits in enhancing technology and products not just to make more money but also to explore the unknown and new frontiers.

Two new youthful examples of technology-billionaires are Steve Jobs, founder of Apple Computers, and Bill Gates, the inventor of software package at Microsoft. During the early 1970s, a Japanese company was looking for a chip to make an inexpensive pocket calculator. After starting a design the specifications kept changing and the designer was forced to build more freedom and flexibility to programme various options. This gave birth to a new device called microprocessor. In spite of there being thousands of academics, professors, scientists and brilliant engineers, it took a high school graduate, Steve Jobs, to build the first microcomputer in his garage. This gave birth to a whole new multi-billion dollar industry for personal computers with Apple leading the track. In the process Steve Jobs and his colleagues made hundreds of millions of dollars for their pioneering and enterprising work.

Similarly, Bill Gates, at a very early age, developed a special software programme to work with the IBM personal computer and built a company called Microsoft, which made him a billionaire in less than a decade. This is the power of modern technology in achieving instant wealth and instant success. It must be emphasized, however, that for every successful venture there are probably five to ten failures and many burnouts and divorces, which result from the kind of hard drive one needs to make a break in the high technology business.

Silicon Valley, and other technology parks, are full of these success stories about how wealth has been created, collected and redistributed among the young entrepreneurs exploring new frontiers.

Technology has played an important role in my life. It has helped me transcend the caste and community barrier. It has given me tools to make new friends, develop new products, explore new opportunities and participate in creating new wealth for me and my family. It has widened my horizon and allowed me to take a broader view of the world. It has given me confidence and a new culture to deal with the most advanced, affluent and sophisticated people and systems the world over. It has also given me stable self-esteem to be a good team player. Technology has made me a world citizen with a concern for development and eradication of poverty, particularly in my country of birth, inter-

est in US technology, growth in Asia Pacific, Perestroika in the USSR and market potential in the EEC of 1992.

I believe that because of my technology orientation, my reflexes and my ability to deal with the new situation have improved. I am comfortable in the most rural setting with bullock carts and cotton fields and I am equally comfortable at international airports, skyscrapers, stock markets and fancy restaurants. However, it has taken me partly away from my roots in Orissa, where I was born, and Gujarat, where I went to school, to global issues and global challenges. Maybe technology has alienated me from my people and their needs. Maybe I am not sensitive to their problems and priorities but, at the same time, I feel I have the instruments to help on larger issues.

While I was growing up in a small village in one of the most backward areas of the state of Orissa, my family had all the traditional values and virtues related to caste and religion. We were born Hindu carpenters, who are supposed to be sons of the artisan god, Vishwakarma. All our close relatives, none of whom had ever finished high school, always talked about religion, relations, caste, community and financial matters. Everyone was trying to make ends meet. Survival was their sole preoccupation. The normal home conversation centred around children, and programmes aimed at ceremonies, engagements, weddings and visiting relatives. Education was never on the agenda. My father was an exception because he had felt humiliated while selling nails to the English rulers because he did not know English. As a result, he had at the back of his mind a burning desire to educate all his children. He wanted to liberate us from this traditional lifestyle.

When I was nine years old and my brother 12, he sent both of us to a boarding school, several hundred miles away in Gujarat to acquire a different culture and different tools. Being the sons of a carpenter, at school we both decided to go in for technical education as opposed to Sanskrit and History. At an early stage, this gave me an opportunity to learn about building things with my own hands to precision, and quality. Education in mechanical, electrical and machine drawings kept me away from *shlokas* and history.

Back home, during the vacation, we stayed away from traditions and concentrated on home wiring, radio repairs and other technical activities. At school, our caste was a concern to many, but our grades impressed them and we were held in high esteem. We were part of a new caste of good technical students at school.

In college, while studying for my specialization in physics, I was active in dramatics, debating and many other extra-curricular activities. This gave me a broader exposure and respect from my student friends and kept me away from community functions and festivals. There we were out of caste because we were studying at college in English medium and also studied physics. Being away from home, and staying in dormitories, helped us to stay away from small rituals and customs related to local festivals and religious functions. This alienation, in my view, helped us to further sharpen our technical attitude, approach,

reasoning and logic. In the process, we learnt to deal with the future, without relinquishing too much of the past. Dr. Prakash Desai, a friend and an eminent psychiatrist in Chicago, used to say that I escaped the traditional trap in India by not going to temples and developed an objectivity and clarity by staying away from the family.

Finally, when I joined post-graduate classes in physics for the MS degree, with specialization in electronics, I felt I had arrived, and was ready to deal with other adults on equal terms. Now that I was a student of electronics even my Brahmin friends realized that my future was assured. Electronics was one of the most modern scientific subjects during the early 1960s. This mattered much in social circles. In a normal crowd, I would be a rare young man, with interest in electronics, while others would be studying law, accounting, humanities, or commerce. In a sense, I slowly acquired a new caste—the technology caste. Most people started referring to me as a student of electronics instead of a carpenter's son. During my studies for the BS and MS courses, I started teaching students at home. Most of them were well to do, from upper middle class families. They and their families also started recognizing my technology tools and respected me for my knowledge and did not bother about my caste. By now my caste had taken a back seat and technology was driving my future.

During the first year of my graduation studies, I fell in love with a Brahmin girl. She was easy to convince, but her parents were a problem. Even my mother could not consent to my marrying a Brahmin girl. Her worry was—What would happen to my four sisters? How would they marry if I did not marry within my caste?

Finally, as desired by my elder brother, I went to the US in 1964 to study at the Illinois Institute of Technology. There I acquired some more technological expertise. After two years, and a Masters in electrical engineering from the US, I was good enough to convince my future father-in-law. He was now prepared to let his traditional Brahminical values change, and allowed his daughter to marry me. Finally my fiancee came to the US and we were married at the YMCA in Chicago on December 26, 1966.

By now my caste had been completely erased. My old friends and relations were distanced and my wife and I were working hard in computer related activities. We felt liberated, and we were interested in bringing our brothers and sisters to the US for further studies.

I was fortunate enough to have an opportunity to work on the state-of- the-art digital switching technology during its early stage of development. I was part of a team exploring new frontiers. Every problem we encountered, ultimately resulted in a patentable invention. This made me a small time inventor at an early age. By now I had acquired enough confidence in the American world of technology and was visibly recognized. I started presenting papers and teaching courses at major national conferences. This gave me exposure as a technocrat. I made many great friends in my field. In the US, the telecom community is like one big family. I became part of this family. No one there bothered about my

colour, caste, community or my nation of birth. I was Sam the Switching Man!

When I started a new company with my two great American friends, I acquired the caste of a globe-trotting businessman. Finally, having made my millions, I decided to return to India to try yet another American dream, to explore some new frontiers in building a telecom infrastructure in India. While I worked with young fresh graduates for the first three years I was isolated and shielded from the Indian caste system at work. However, when I moved into the larger arena I realized that there were cadres and strong networks of relationships which were the chief driving forces in the Indian business and government institutions.

My children, having been born and raised in the US, had no concept of our caste or community, roots or relatives. All they knew was that we came from India. They were born in a family of technocrats and started dealing with technology related to electronics from their very birth, in the form of toys: TVs, calculators, stereos, cameras, video recorders, computers, video games etc. To them, technology was part of a tradition, and their tomorrow depended on handling more of technology. They learnt to operate computers at the age of six. By now, like any other children of their age, they have learnt to handle a computer system as a tool to enhance their education and experience.

I find that because of their long interaction with computers, these computer children are more logical, organized, open, precise and predictable. They reason out confidently and learn to solve a problem and resolve conflicts on their own. They understand the meaning of time management and resource allocation. They respect knowledge and not age or experience. They believe in equality and are not afraid to disagree. They are obedient but not blind followers. They constantly question blind beliefs and petty procedures. To me, this generation of children represents a great hope for the future.

The discussion on technology will not be complete without emphasizing the fact that in the history of technology the atomic explosion in Nagasaki and Hiroshima was the most profound technology statement and the most painful experience for mankind. The explosion made it clear that with the power of this atomic technology the entire human race can be easily wiped out from the face of this earth. In spite of this realization, arms build-up started. Finally, after 40 years of Cold War and loads of nuclear warheads, common sense seems to be prevailing.

Other technologies have taken over in the last 40 years to make living enjoyable and also increase human comforts. These pervasive technologies have given improved transport, communication and many consumer products. Just think of the amount of food and clothing that technology has provided to feed and cover six billion people, day in and day out, with a variety of products generated by mobilizing raw materials and resources from the earth. Technology has changed the standard of living, management methods, environment at home, and at work, and the minds of millions around the world. It has also made many parts of the world richer than ever before. It is no longer profitable, or

even necessary, to spend national resources on destructive designs. Instead, the same resources could be diverted to build products and services which people require to improve their living conditions and comforts.

4. Information: The Force

No other technology in the last 300 years has had the kind of impact that information technology will have on the social, political and economic fabric of society. Information technology will far outweigh the industrial revolution of the last 200 years, in its implications related to the way we will work in our offices and factories and the way we will live in our homes. It will change the way we think, act, educate and associate. Information is essentially a starting point for knowledge. Knowledge is required for decision making and for taking initiative. It is only through initiative that one can take appropriate action to implement ideas, programmes and projects.

Information technology will change the work environment, work habits and work norms in offices, factories, government, business and universities. It will provide new tools to deal with knowledge, and as a result, will have far-reaching implications on the future decision-making process. With electronics technology, relevant, useful, timely and accurate information will be available to enhance understanding and utility of knowledge. Information technology will also have an impact on life and leisure at home. It will provide many new tools and techniques to deal with routine activities at home and leave more free time for leisure. Information technology will indeed change the manner in which the present work is created, distributed, handled, organized and accomplished. The information revolution will have far-reaching implications on political ideologies and social thought. It will invade not only offices and homes but also farms and fields, health centres and hospitals and many other critical activities and areas of production, services and development. Information technology will help cross social barriers and national boundaries and network people from every part of the world, irrespective of their nationalities.

Information

Information systems have two distinct elements: hardware, such as computers to compute, memories to store, printers for a hard copy, and telecom to transport; and software to give necessary thought, logic and instructions to act and perform the necessary programmes for various applications and tasks. Of these two elements, software is becoming critical, difficult and challenging and constitutes the larger portion of the costs. Software involves brainware and thinking process. As a result, it is expensive and time-consuming. Software products, no

matter how complex and expensive, are always documented on paper or stored in magnetic media like floppies or hard discs. These software products can penetrate physical barriers and cross national boundaries via the normal post office, telephone lines or satellite-based data links. Today, multi-million dollar software products are being designed for export in developing countries, because of inexpensive and available brain power. These were transmitted through satellite links connected to large computer systems and networks in the US and other Western countries.

Information technology has come as a force to move our cultures, customs and communities and advance human civilization. In the process, it will find new applications, create new jobs and bring equality. It is generally believed that information technology is only for the rich and the affluent and is needed only in modern work environment. However, information technology is equally useful in population control, health services, agriculture, water management, transport and other major infrastructures along with steel mills, business centres, and travel agencies.

Developed nations of the West have emphasized and utilized information technology for automation, artificial intelligence, robotics and many other advanced applications. In developing nations, the same information technology can be equally used to provide basic human needs and improve standards of living. However, proper appreciation and application of this technology require a new information culture and a new orientation.

The need for information developed during what we may call the agricultural civilization. To enhance agricultural activities, it was necessary to share information and knowledge in society. With agriculture, various communities developed, and their need for information developed further. Earlier, transfer and exchange of information were done orally. Then, with the print media, information and knowledge achieved a broader reach. With the introduction of the electronics technology the concept of information storage, processing and transfer has changed drastically. Now it is possible to move information with the speed of light across the globe.

In the early days, only selective pieces of information related to secret services and security were sold confidentially. Now, information has become a commodity and is available on the shelves of department stores, properly packaged and openly priced. Today, information regarding people, places, products, prices, plans, projects and programmes can be easily marketed through the electronic media. There are thousands of companies all over the world, with millions of people engaged in information processing and programming activities.

In traditional systems, information is considered to be power and power is difficult to share. People normally hold on to information and are very selective about sharing it with others. The modern information systems are designed to bring openness, accessibility, accountability and connectivity. With modern electronics hardware, information is available on computer and television terminals to everybody in a variety of forms and formats. This forces openness.

Take information related to the financial performance of a company. Earlier, this kind of information was available only to the Chief Financial Officer in the form of a general ledger and other financial reports. He usually derived his power from the fact that he was the only person who had an intimate knowledge of the financial details, company performance and its associated implications. With computerized financial management information systems, any bright young person will have all the financial data available at the push of a button. He will also have programmes and tools to analyse financial information in far more detail than earlier. With this capability, he is equally knowledgeable and as a result the Chief Financial Officer sees his financial power eroding. He feels threatened and insecure. He does not want computerization to succeed. He resents the openness that the electronic information capabilities bring in.

Whenever I am at Chicago's O'Hare Airport, I think of the power of information in managing massive movement of millions of passengers and thousands of flights. At O'Hare there are two flights every minute during the busy hours. The credit for making the system work goes not only to the computers and air traffic controllers but also to the large number of displays all over the place with information on arrival, departure, baggage transfer, gate numbers, etc. This information is openly available to everyone to manage and monitor their timings and activities. For example, as soon as the gate is assigned and the flight is ready to arrive, everyone involved at the gate gets moving and things begin to happen automatically.

I firmly believe that information technology also brings about accountability. Once information is openly available, everyone knows what he is supposed to do and when. Openness and accountability go hand in hand. Once people know who is responsible and accountable for a special task organization, clarity emerges, interfaces get identified, and interpersonal relationships improve to enhance and assure organizational success. Openness and accountability also bring discipline and democratization.

But openness and accountability do not come easily to individuals and institutions. Old habits die hard. Even today, in many nations, traditional colonial practices are followed. Routine documents are stamped 'Strictly Confidential' with the idea that information should not be shared. Even information related to routine meetings gets delivered in two sealed envelopes, marked 'secret' in big letters. At times, a day after, a similar envelope arrives, informing that the same meeting has been rescheduled or cancelled. Socialist nations have been known to be secretive about all kinds of information. To them, almost everything is secret and confidential. Information is shared strictly on a need-to-know basis. With this kind of background and culture, new information technology is going to be difficult to digest for many.

In developing nations at times it is fashionable to talk about computers and information. People buy personal computers more as a piece of furniture to decorate their offices than as a tool to enhance their productivity and efficiency. A lot of resources are spent on these computers without any appreciation or un-

derstanding of their capabilities. Young and energetic people who appreciate and can use computers, often do not have the resources to buy, and those who have the resources do not have an aptitude or the desire to use them and benefit from them. Unless an information culture with openness develops, electronic information systems cannot help in harnessing resources.

I am one of those, who firmly believe that information technology is bound to bring about cultural transformation in many developing and socialist nations. The information thread will help in networking various cultures and conflicts. New information systems also provide accessibility and connectivity. Together, these two concepts provide networking of information and people the world over. Now large data bases are accessible freely to people through international telecom networks. These data bases contain a variety of information on technology, trade, business, patents, travel, entertainment, and finance, for people to share and interact. Through these, specialists get connected to one another to enhance their knowledge and interests. By providing an interactive capability these networks serve a special role in networking international talent.

Today we are moving products and tomorrow we would be moving ideas. The nineteenth and twentieth century transport systems will be inadequate in the twenty-first century. Moving ideas and information is more difficult and will require a great deal of innovations. In the nineteenth century, we had post offices to move ideas through letters and in the twentieth century, we have telecom to move ideas through voice communication. For the twenty-first century, we are building information highways with new kinds of structures to move knowledge and ideas in an integrated environment to combine the human voice, computer graphics, data and video pictures. This will also require new standards, compatibility and connectivity. For this, new laws will have to be formulated, and new discipline created. This will have far-reaching impact on our concept of transporting people, ideas, thoughts, actions and information. If information and ideas can be flown and floated, movement of people can be minimized and future investments in infrastructure for rail and road transport can be reduced.

Along with information exchange at electronic speeds, the concept of time will change mainly because information would now be available in 'real time' with increased accessibility and connectivity. Needless to say, with reduced response time for information exchange the travel time for interaction between people will also have to be reduced. Today, travel takes too much time: people are constantly commuting to interact face to face. Some multinational executives spend most of their time on jets. This will have to be reduced significantly to enable one to touch any part of the globe and return to his office the same day. What takes 24 hours to travel today will have to take two to four hours to match gains from the speedy information exchange in the next century.

As interaction with machines carrying information becomes common, more and more social relationships will be mediated by machines. Today, for example, insurance claims, banking, travel services, medical diagnostics, require a great deal of interaction with human beings to fill forms, arrange pay-

ments, negotiate differences etc. In the future as machines begin to perform these functions, social interactions and relations will also change. We shall no longer be talking to our insurance agents for our claims. We shall feed in the data and the machines will give us the answers. We may be sitting at home with a terminal talking to a machine in place of making a telephone call to an insurance agent. With the terminals we shall be interacting with a computer at the other end.

The new technology will definitely make it easier for us to disseminate news, information, ideas and messages. It will make distribution much wider and quicker. However, there is a danger. Since this information will have a larger reach with accessibility to all levels of people in a society, it will need to be accurate. But accuracy will be difficult when millions of pieces of information float around at various levels to various individuals and institutions with conflicting priorities and perceptions. It will be difficult to distinguish facts from fiction, right from wrong, and proper from improper. This information and misinformation will be easy to broadcast to the relevant people and places to create confusion.

With a few multinationals dominating information technology and associated networking of people and data, people in the developing world are concerned about the dependency and cultural impact on their societies. Imported technology may mean imported values and imported needs, feelings, thoughts, vision and views. In many parts of the developing world, the TV, which was supposed to be a tool for education, has essentially become a tool to promote Western values. There is this danger also in information technology. The battle between the countries which possess technology and those which need it for basic development will go on in the next century. As technologies begin to integrate, economies and cultures will also integrate slowly but surely. As economies integrate, hopefully jobs will integrate and ultimately a universal culture may evolve in the next century.

Information Technology

The history of modern information technology is quite young. It is directly connected with the history of electronics technology. Earlier, when electronics technology was used for calculations and computing, the speed was too slow, and the equipment was too large and bulky. The arrangements were cumbersome and expensive and were not acceptable either to the user or to the market. The electronics revolution of the last two decades with micro miniaturized integrated circuits, in the form of microprocessors and memories and very large-scale integrated devices, has essentially changed all this. The integrated circuit revolution has reduced cost, size, and power considerably. When I started my career in electronics almost 25 years ago, I bought simple devices such as 4 input NAND gates, for $100. I remember having bought a 16 bit memory device for as much as $16—a dollar per bit. Today, one can buy one million bits,

on the same chip, for less than $10. The density has increased by a factor of 100,000 and the cost also has gone down at the same time. Simultaneously, many new technologies have emerged to put arrays of gates and a lot of logic on a small silicon chip, as tiny as a thumb nail. This has revolutionized computer communications and information systems the world over.

In the 1950s, information was processed in batches by loading computers with punched cards. Individual cards were punched to write information into the computer memories. These cards were then stacked together and read for yes or no type of information. During my college days students floated around all over the campus, with the deck of cards, and waited in line to get their cards read by the machine for inputting into the computer. The nurds always had the thickest deck showing the need for more computing. Batch processing required a lot of patience in scheduling and response time because the problems to be solved in real time required long waiting at the computer rooms. Then came the 1970s—the era for time-sharing, when large machines were installed with various terminals all over the place to time share the computing power which was otherwise expensive. In the 1970s people felt that time sharing was the ultimate answer and would solve most of the computing needs. However, as people started using more and more of time sharing it became cumbersome and apparent that computers would have to be provided in every office and preferably on every desk. The computing power would have to be large enough for the office worker to handle the information load created with more knowledge and service orientation. Thereafter, in the 1980s, work stations became popular. Personal computing was a common sight in the work place in engineering and other offices. Now processing power was available right on your desktop, laptop or pen at your finger tips, in real time. However, all of this was isolated with an island of processing powers and needed to be connected. In the 1990s, we see the need for an open network structure where all the computing power at finger tips can be shared and connected by many users. With this it can be easily accessible and moved around to share data between various people. Connectivity requires technologies to be standardized.

With these developments in computing methods, the manner in which we process information has also changed. In the early days all we could do was manipulate a bit at a time with software commands. Later on we learned to manipulate bytes. Microprogramming and machine language were very common in the 1950s and 1960s. Then came higher-level languages from FORTRAN to BASIC to PASCAL and others. These languages increased user interaction, programming capabilities, and problem-solving became a bit simpler. Later we learned to manipulate words and texts and, finally, graphics. Now hundreds of software packages are available all over the world to deal with a large chunk of information whether it is word, text or graphics.

The next challenge is to learn to process events. Take a routine conference. To organize or attend a conference, one has to make many decisions and do several things. Whether it has to do with travel, accommodation, messages, pres-

entations, exhibitions, small get-togethers or dinners, all these activities in normal work environment relate to one single event called 'conference'. There is no reason why future programming languages cannot be developed to handle several key events to process relevant work, activities and actions. Event processing will then automatically organize all activities related to searching, sorting, gathering, analysing information and various other communication exercises which relate to that specific event.

Information technology is definitely heading towards cost effective solutions, with smaller size, high speeds, more flexibility and greater performance. However, unless information technology becomes pervasive, it will not have an impact on the way of living, on thought and on culture. In many parts of the world, information technology is still a laboratory curiosity. For others, it is still a tool. Unless it is produced in large quantities, as an acceptable instrument of change at all levels, whether at schools, factories, industries, homes, public places, restaurants, cafeterias, or hotels, technology will not be pervasive. To be pervasive, information technology will have to provide proper connectivity, either through telephone lines or through special data networks. The key to connectivity will be adaptability, commonality and standards.

At present it is difficult to offer universal connectivity for information product because information is not yet a utility like electricity or gas supply. When electric utility services are provided, we are free to interconnect a bulb, a fan or a shaver. Electric companies do not insist that we use only a certain model of shaver or toaster or blender or bulb. Similarly, to provide the type of connectivity we shall need in the future information age, information technology will have to be developed to a point where anything can be interconnected to the information pipeline without the restrictions of today (like 'only UNIX 5.3 can be connected', or 'the system will have to be UNIX based and will interface only with 'C' language software'.' For information technology to be pervasive, it will have to have the necessary transparency for the user. We shall have to learn to ride technologies and make our systems more user friendly, foolproof, and simple for people to connect and operate.

This will require industry-wide standards. Standards block the markets and the spirit of competitiveness and are not appreciated in some industrial forums. But standards also open closed doors and allow one to explore new markets for broader applications. It is clear that the information industry is heading towards developing standards and enforcing them to increase connectivity. The debate on standards has been going on for the last 20 years. Finally it appears that industries are coming together to sink differences and evolve interfaces for hardware and software commonality and connectivity.

Communications and Computers

The significant part of the information revolution of today and tomorrow has a lot to do with the merger of communications and computer technologies. The

telecommunication technology of today interconnects over 500 million telephones for over five billion people the world over, who are both the source and the final destination of the information. Traditionally, only the human mind could generate processes to receive and create information by observation, conversation, interaction, imagination and thinking. Today, a part of these processes have been taken over by the electronic machines capable of deducing, and sensing information. Machines are now also capable of storing, retrieving, transferring and transmitting information. Telecom highways, which interconnect over five million telephones have been effectively used to transfer information by telephone, telex, electronic mail, radio, satellite, etc. To these, computers are added to assist in processing and storage. As a result of this merger, we can now select and retrieve instantly what we need and when we need with a great deal of precision. Never before has knowledge been so easily and instantly accessible.

Traditionally, telecommunication networks have been designed to transmit analog-voice-information over twisted-wire copper cable. The main function of this network was to provide voice connectivity world-wide. In the last two decades, analog-voice has been effectively converted into digital signals, similar to computer signals. This has given a tremendous number of opportunities for transmission and switching capabilities over the same twisted copper wires for voice, data and video images. This conversion in the last two decades is nothing short of astonishing. Through digitalization, communication equipment has been reduced in size, cost and power, and made more versatile and swift.

Simultaneously, computer technology also has progressed in hardware and software to provide innovative and cost effective solutions for information handling and processing. By combining computer technology with telecom networks to superimpose processing on transmission and transfer, a whole new set of functions, collectively called 'value added services', have been created. These include functions like electronic mail, video conferencing, facsimile, data transmission, etc.

With this integration of computers and communications, it is now possible not only for people to talk to the machine but also for the machine to talk to another machine automatically. With this merger, a variety of new interconnective services are also envisaged for conferencing, newsprint media, training, education, shopping, etc. The world telecom community is busy exploring these concepts, generally known as the Integrated Service Digital Network (ISDN), to administer the benefits to society at large. With automatic dialling, we could connect voice channels automatically on our own. Now with ISDN, some day we will be able to connect a variety of services for voice, data and video on our own without involving operations or interruptions.

The expansion of telecommunication networks over the past two decades has been tremendous. The conversion of transmission network into digital, with value-added services the help of digital switching, has indeed created new highways for the future. Along with this, the benefits of fibre optics and satellite

links have increased capacity and reliability substantially. With these new networks, now the world is connected completely, and is accessible instantly, to many. For example, stock exchanges are operated predominantly on these modern networks. Telecom highways of the last decade are being totally reworked to meet the needs of tomorrow, which will be the nerve system of the world and link together the whole human race, for unity and integration.

This offers a tremendous potential for technology and man. To achieve connectivity, networks within networks are being built for international, national, public, private and other special services such as education, health, safety, transport, weather forecasting etc. These incorporate local area networks, long distance networks and wide area networks for greater connectivity. Earlier, telecommunication meant just the telephone. Now, it means the whole set of new computer and communication technologies including data bases, software, applications, security and many value-added benefits.

With the merger of communication and computers, global networks have become a powerful tool for economic, social and political change by offering more choices to network people and information to everyone throughout the world. These networks are used to exchange ideas and information between individuals, business organizations and, most important, to keep pace with others. Earlier, we thought that speech communication sufficed for the promotion of understanding. Now it is well accepted that data communication is equally essential for the promotion of better trade and business (for information on inventory, market demands, financial needs, product perspectives, cost and other parameters). These modern networks provide a higher degree of communication between various users and thus provide a higher degree of understanding and appreciation of one another's requirements.

Applications

Information technology is finding applications in offices, factories and many other areas vital for meeting basic human needs such as water, energy, health, etc.

Offices: The office of the future concept, with electronics technology, is aimed at creating paperless offices to document, file and transmit information at electronic speed. In a normal office environment there is an explosion of information. More information does not make work and decision making easier. What is needed is relevant knowledge out of the large information base. The office of the future relates to very many new equipments and facilities such as electronic mail, word processor, electronic filing, conferencing, data-base management, fax, and a variety of other new features and facilities. The entire focus is on increasing the productivity and efficiency of the white collar and managerial work force.

Hundreds of thousands of dollars are spent in equipment and machinery on

the production floor to enhance the productivity of blue collar workers. However, when an office worker is appointed, normally he is given only a desk, a chair, and some paper and pencils. It is only recently that some new tools have been developed to improve office productivity. The starting point in this area was an electric typewriter for the office secretary. Now, this has changed to fancy computer aided design equipment for engineers and programme management tools for executives and managers.

On an average, a manager spends 60 per cent of his or her time in meetings, and a significant time on telephoning, communicating and coordinating. The task of automating more complex managerial and engineering jobs involves innovative solutions. The task of secretarial activities is relatively simple and straightforward because it deals only with typing, scheduling meetings, filing, etc.

The pressure for electronic offices has come from the competitive environment, internally within the organization, and externally from the market-place. The internal environment relates to the demand for faster growth, more productivity, cost savings, and material savings in order to increase profitability. This demand comes in the form of pressure from the bosses and the board. Similarly, employees demand higher wages, higher benefits, education allowances and improvement in the work environment which requires an increase in investment. The external pressure comes from competitiveness, inflation, higher interest rates, energy shortages, new investments, need for new talent and skilled workers, labour laws and many other areas. The real external pressure comes from the rate of innovations in the field to generate new technologies and new products. These pressures essentially demand performance from the executives, the managers and the marketing people who in turn need to improve their tools.

Today, all kinds of special hardware and software packages are available to configure new office environment. The office of the future will be wired for information outlet as for electricity. Through this outlet, all kinds of information, related to hardware and software products, such as electronic mail, energy management, security, fire alarms, etc., can be connected through simple plug-in devices. Though today this is a distant dream because of lack of interface and standards, in the next decade it will be available in many parts of the world. This concept will not only integrate building wiring for voice and data, but will also integrate a variety of services and facilities, some known and others not yet known. To survive in the competitive environment of the future, management throughout the world is being forced to convert into reality the concept of the office of the future.

Factory: The factory of the future will emphasize application of information technology on the production floor to improve productivity and efficiency, quality and competitiveness. The present factory normally focuses on four fundamental elements, namely man, material, machine and money. All factories have evolved essentially because of interaction between man and material.

Machines were given to increase productivity and money was required as an input to set up the infrastructure. In today's environment all issues related to these four fundamental elements have become very complex and difficult to deal with manually.

Most manufacturing processes involve a large variety of operations. Today's ever-changing environment demands short delivery cycles, minimum re-work, re-make and constant flow of material. In today's complex environment, manufacturing challenges lie in the ability to decrease delays, reduce labour costs, improve inventory management and increase profits. This becomes even more challenging because our products are becoming complex and our services even more complex. In most manufacturing operations now, the emphasis is on changing from economies of scale to economies of scope. All this requires highly complex information systems for production planning, materials management, shop floor control, financial management and many other activities. It is only through sophisticated tools like these that proper return on investment and return on assets can be guaranteed.

Modern manufacturing systems deal with five major areas of production. These are production planning, materials management, sales order entry, financial management and various other special systems related to automation, control, artificial intelligence and robotics.The key to these systems lies in appropriate software and flexibility to implement many of the standard manufacturing methods and practices. For example, production planning begins with the definition for parameters on various departments and processes coupled with information on customers, employees, products and standards. With this kind of data base, production planning provides order entry, production scheduling, quality control, production statistics and overall scheduling, forecasting and long-term visibility.

The idea is to monitor at every stage in the production process, to optimize performance and reduce cost. Many of these systems in the Western world are designed to automate everything from order input to final production and shipping documents. There is a great deal of flexibility at every point in the production line to manage and monitor various parameters to improve performance. The heart of the production planning system in today's competitive world is materials management, commonly known as MRP (Material Requirement Planning). Because of heavy investments in the materials to be purchased from the globally competitive market, it is important to schedule materials to achieve a minimum inventory. This is known as the 'just in time' method of materials management which has been highly successful in Japan. Along with MRP, standard financial management system to include information on account payable, account receivable, general ledger, pay roll, invoice, etc., is also necessary.

To integrate production planning, it is essential to tie computer-aided design process, control and other instrumentation and automation equipment together. Through such integrated systems, proper discipline is infused on the shop floor

with control on quality and the expected quantum of everyone's daily output. This also gives the needed visibility to management to analyse the production performance.

Making information systems an integral part of the factory of the future is a very complex and cumbersome process. It requires coordination at various levels with people from various departments and disciplines in the company. These include finance, sales, marketing, purchasing, production, casting, personnel, training, communication, computer and management people, working together as a team. It takes a lot of time and energy to implement these systems and they run into resistance. In general, people on the factory floor are used to routine periodic tasks and are not very open to innovations and experimentation. For a factory of the future concept to be a reality, first their minds have to be changed through proper training. It is only through their cooperation that information technology can succeed on the production floor. Those who have successfully implemented some of these concepts have shown an increase in productivity of up to 40 per cent, reduction in overtime by about 90 per cent, reduction in delivery time by some 20 per cent and many other improvements which are essential for competing in the global market-place.

Basic Needs: While we were working on the technology mission related to drinking water in India, a group of people in a meeting was pushing for the import of 40 drilling rigs at the cost of several million dollars. When it was asked how many drilling rigs were there in India, there was silence. No one had this information which was required to make the basic decision on future needs. After some time a representative of UNICEF came through. He said that there were around 1,200 drilling machines in the nation. Based on this information, the next piece of information that was required was—how long it takes to drill a water well and how long it takes to move the drilling machines from one village to another.

Once again, no one had the kind of information that was required to make an intelligent decision. After a few weeks we were told that on an average it takes ten hours to drill a well and about ten days to move from one village to another. From this it was clear that once the drill is available a lot of political pressure was built up to change plans and priorities to move this machine. If the machine could be moved from one village to another in less than five days with proper planning in advance, we would automatically have 1,200 more drilling machines and there would be no need to import 40 more. This piece of information was worth millions of dollars in terms of foreign exchange. But before these questions were asked, people trying to push for more imported machines were blaming those asking relevant questions. The latter were dubbed as people who did not understand the plight of the drought-affected poor. They were also being blamed for not appreciating the realities in rural India and it was argued that living in urban areas with all the piped water supply they did not realize the sufferings of those who needed the drilling equipment. The argument did make

sense but was not based on facts and figures. It lacked the relevant information and accuracy.

In an effort to set clear objectives on the water mission a brainstorming session was organized, when we decided to document our objectives and develop a consensus on the basic goals. The first question was: What was our objective? The answer came that we had to provide water to rural India. What did you mean by this? To how many villages? How much water? Where, when and what kind of water and related questions needed to be answered to clarify the objectives and the focus. After a great deal of discussion and debate it was agreed that we needed 40 litres per day per person. Naturally, the next question was: How much of this would be for cleaning, drinking, washing, bathing, etc.? And then, what about animals? How much water did we need for the cattle? Finally, we came to the conclusion that we needed some 30 more litres per head per day. But then, could we really use this average for the camels in the Rajasthan deserts and the goats in the Himalayan mountains? All this information base had to be the starting point for a national plan on rural drinking water mission. Once it was decided that water had to be provided to at least 100,000 problem villages, it was necessary to define clearly what we meant by problem villages and where these villages were. Could we get their names from the respective state governments? This turned out to be a major exercise mainly because state governments were used to giving numbers and not names. They knew that their funding would be based on the numbers. When we asked for names there was little scope for fudging. Giving names meant being open about the targets and the accountability with specific individuals and assignments.

No one had earlier articulated and appreciated the role of information systems for providing drinking water in rural India. In fact, as a part of the mission exercise, when we started reviewing the various forms people had to file on water, we were surprised to learn that there were over 300 different forms related to rural drinking water activities. They came in all sizes and shapes with a variety of rows and columns asking for all types of relevant and irrelevant data. It was clear that this information had to be organized, sorted, collated, filtered and standardized. Finally, one bright young engineer was given the task of consolidating all these forms. To everyone's surprise, he reduced 300 forms to 12. The impact of this exercise on productivity and efficiency was significant.

On the immunization mission, which was designed to help reduce infant mortality resulting from vaccine-prevented diseases, the information system was equally critical. To our surprise, we found that because of varying social conditions, various states and districts had their own way of tabulating information. Some did not even bother to write the name of the mother saying that she had no social status and nobody knew her in the village. In their judgement, the father's name was a sufficient piece of information. In this case also we had over 200 different forms which needed to be consolidated to bring some order to standardize the information.

Many are afraid that modern information systems could be effectively used

to centralize more and more powers and could be counter-productive in a democratic society. The power of information could then be used in a centralized system against the people at large. It is true that information can be created and it can be destroyed and it does have a potential for great good and great evil. But it is also true that modern information systems through networking give larger accessibility and as a result it is indeed difficult to control and manipulate information in isolation. We believe that the phase where information, centralized, could be used as a source of power, is over. No amount of effort now will keep information isolated and concentrated in the hands of a few.

In the modern world with ever-developing sophisticated facilities and services, the rate of information exchange determines the rate of successes or failures in the corporate world. For example, Jack Welsh, the Chairman of General Electric, USA, with annual sales of around $50 billion was visiting India. While flying in from the Far East in his private jet, he and his team were making a multi-million dollar deal to acquire a company in Europe. The deal had to be finalized before midnight. Faxes were flowing and telephones were ringing all over to coordinate information from the four corners of the world. Making a deal in India for a company to be acquired in Europe by a US conglomerate while flying in from the Far East was feasible only with the power of information technologies and relevant infrastructure. This is an example of how technological developments make it possible for people to be available at different places, at different times, for a variety of different things at an ever-increasing speed. They become available in spite of heavy and hectic schedule to deal with information encounters of the right kind.

Technological developments invariably increase the time for leisure and as a result generate more consumption capacity for society. Normally, people of the lower class do not have the resources to consume new technological toys and tools, while the upper class do not have the time. They are more active with new information interactions and do not need to tinker with technology directly. As a result, people of the middle class, more specifically the upper middle class, create demand and consumption for the new technology and tools. They have the purchasing power, time and resources needed to experiment and they consume technology-based commodities more readily.

Service Society

As the world moves away from capital intensive industrial base to knowledge intensive information base, the role of the service sector will increase substantially. As more and more manufacturing goods are produced with less and less people, through better productivity, efficiency, automation, robotics and other information-related technologies, additional jobs will be created for the service sectors. In other words, hard manufacturing jobs requiring muscle power and routine work on the production floor will be reduced and more soft jobs requiring brain power, knowledge, creativity and human interactions will increase in

offices. These jobs will be in the areas of financial services, insurance, travel, leisure, customer interface, design, marketing, sales promotion, public relations, etcetera.

The service society of tomorrow will have more service-oriented white collar, as compared to blue collar, jobs in industry or agriculture. For example, in the US agricultural jobs got reduced from 70 per cent to 3 per cent of the total work force in less than 100 years. Now, a very small part of the population works on the farms to feed over 250 million people. They even manage to export a substantial amount of foodgrains. This was possible with mechanization, as also fertilizers and other technological inputs. The same thing is now happening to manufacturing industries—paving the way for the service industries of the future which will require a new work culture and a new work environment based on real flexibility, freedom and democratic values at all levels in the organization.

In the not too distant past, jobs centred on meeting the basic human needs for food, shelter and clothing, to include farmers, carpenters, blacksmiths, butchers, tailors, etc. Along with this came the concept of work hierarchies with the middle class, the lower class, the ruling class, and the serving class to provide a clear distinction in the division of labour. People who worked on handicrafts and in arts were the early knowledge based workers. Thereafter came the Industrial Revolution when science and technology played an important role. Trade expanded, manufacture got developed and new jobs were created for machining, engineering and manufacture. Most of these jobs such as electrician, technician, tool designer, plumber, etc., were not even dreamt of during the early agricultural activities. They emerged out of new technologies and new developments. Similarly, the information age when computers and communication related technologies will be critical, new types of jobs will be created. Some of these are known today, while others are not even conceivable.

Knowledge doubles every five years, creating the need for new skills. Some of these skills are required only to keep the technology going and innovations flowing. As a result, to some extent, they have an overtone of requirements of the advanced Western nations. Developing and socialist nations normally are far behind in developing these technologies, and take some time in creating a significant number of these new jobs. The old jobs and functions are still predominant in the developing world. Until work gets modernized, they cannot be eliminated. These old jobs relate to routine functions, provide little job satisfaction, and require very little information content. They also relate to specific tasks to be performed in isolation and do not require much interpersonal relationship or interaction for an exchange of information.

It is believed that today we have roughly 40,000 different kinds of jobs. These can be compared to hundreds of castes that prevailed in the early Indian system, to identify specific job functions being performed by various groups of people. It is estimated that over 10 million new jobs will be created in highly skilled information-related activities in the next decade. These jobs in the ser-

vice sector will relate either to managerial functions or to technical and service functions. This will, no doubt, eliminate and upgrade some of the existing jobs. For example, in advanced nations jobs like those of peons, file clerks, elevator operators, etc., are no longer useful. Instead, new jobs like those of computer operators, receptionists, programmers, system analysts, etc., are very common in the new work places.

All future jobs will have a large information content. These will essentially be jobs in the 'softer' sector with service orientation and will demand new management techniques. The new jobs will have more to do with one's mind than with one's hands. They will have a lot more to do with leisure than with labour and training than with tools. They will require more entrepreneurship than energy.

These new jobs will, no doubt, bring new organizational structures. Today's hierarchical structure, which is based on command and control from the top, will have to be replaced with one suitable for knowledgeable and educated workers. In today's world it is assumed that knowledge is at the top and people at the bottom essentially perform routine activities and need only directions or orders. Today, organizations have many levels of hierarchies, to centralize control essentially at the top. As more knowledgeable and educated workers are inducted in a normal work environment, more information and knowledge will be available at the bottom of the organization and the top will be able to understand and appreciate this vast knowledge base to make decisions necessary to command and control. As a result the functions at the top will change from command and control to communication and coordination. Hierarchies will break and organizations will form networks of people to exchange information through local area electronics networks. The top will have the limited task of motivating, managing and messaging.

All new organizations of the future, in which information content will be critical and predominant, will use a management structure more like an orchestra where the conductor essentially gives a sense of direction to consolidate and coordinate to a large group of musicians. In an orchestra there is no department of violin or department of drum, there are no hierarchies such as senior violinists, senior drum players etc. In a sense, the new executive may have hundreds of people reporting directly to him. The system would be structured in such a way that the future manager/conductor would coordinate activities of a large group of people without multiple levels and work hierarchies to play the same tune and produce the same product.

Learning new careers would require a great deal of training and a change in attitudes. Training would be related not only to the tools and technologies, but also to the methods of management, organizations and the related new work culture. Simultaneously with this the corporate values in the organization will also have to change. In the future corporate world, business and professional values will not be the only values because people will now be a part of the knowledge society and will have broader perspective and larger commitment to community

and society. In the knowledge society education will play an important role. Today, after getting a degree very little education is required in the normal working environment. In the future, education to acquire more knowledge, through 3-5 years of formal training would be a necessity.

Information technology with its openness, accountability, accessibility and connectivity is forcing corporations to be self-motivated, self- managed, decentralized networks that resemble a group of small enterprises with freedom and flexibility to operate independently in a free market. These new networks of enterprises are still governed by a large number of share-holders and a board of directors at the headquarters to outline the basic values, broader business strategies and overall social objectives. Small is beautiful, and many large multinational corporations are now encouraging talented managers to exercise freedom and use modern information technologies to connect and derive strength from headquarters.

Information technology will indeed produce new standards for the free enterprise system and force government, business and labour to form new partnerships to enhance flexibility, democratic norms and a competitive market economy. This trend will bring world resources at the information terminal for improved costing, pricing, delivery, markets, etc., to increase productivity for the new managers. This trend will also bring the antagonism between the Left and the Right to an end to integrate and evolve a new economic order.

In the last 40 years, because of a growing hostility between the socialist and the capitalist superpowers, many disorders have been created, relating to economy, environment, ecology and other human developments. Now, with information technology, experts from both superpowers are beginning to recognize the benefits of openness and networking of human talent for cooperation as opposed to confrontation. It is now being appreciated that networking of knowledge will bring liberal democratic values and conservative competitive values together as the most striking feature of the future. The new information culture is believed to be capable of bringing about a creative union of the Left and the Right.

This has been recognized by the technocrats and the leaders of the two superpowers. If networking of knowledge implies networking of cultures and customs, the economies also have to be networked and integrated. This may lead to shrinking the world with a larger reach, and common standards for trade and technology for everyone to benefit from.

The Western economies have already been in tune with free enterprise and information culture. For the socialist nations, there was a need to change the direction so as to benefit from the future force—information. What had been happening in the Soviet Union and the East European nations in the past few years was in response to the force of information spreading like wild fire. It was no longer possible for the socialist system to remain alienated from the information technology related to creation, preservation and dissemination of ideas. However, to gain economic advantage from information technology, the political and

social norms had to change in order to bring openness, accountability and democratic values with freedom and flexibility. Hence Perestroika—restructuring of the entire society.

5. Perestroika: The Explosion

The Soviet Union has been a great power but has had difficulties in catching up with the rest of the world. Its population has always been larger than that of any other nation in Europe. It has the largest land area in the world and is richly endowed with natural resources. It has great culture, tradition and technological base. It has defeated France, Germany and Italy, built a massive defence infrastructure and sent man into space before the Americans could do it. And yet the 'Soviets' have remained behind in many areas. The fundamental failure has been in the areas of economic development, individual freedom, standard of living and the ability to bring the benefits of technology to the people in respect of comforts and communication facilities.

The founding fathers of 'Soviet' Russia emphasized on building heavy industries, steel plants, irrigation dams and defence machinery— but they ignored market economies, consumer demands, modern management and free enterprise. The result is that the people's standard of living is far below that of the Western world. In the past, Russia's communist leaders ran a military machinery beyond the means of the domestic economy. This is the main reason why Perestroika (Restructuring) was needed—to cut military spending and systems and divert much of this infrastructure to manufacture consumer goods and meet the growing aspirations of the people to improve the standard of living.

In Britain, industrialization went along with the gradual growth of parliamentary democracy which spread the power from aristocracy to a merchant class and slowly to the people at large. In democratic societies like America even when slavery was very common, money and power went side by side and hand in hand to build free enterprise and entrepreneurship. In Japan and Germany, industry was pushed forward by their authoritarian rulers. Russia set out to modernize first under the Czarist, and then under the communist dictators. While other dictatorial regimes could modernize, Russia could not do it. The transfer of power from one autocracy to another came more than 70 years ago through a revolution which disturbed the social order. But then France had a revolution too and it did not take much time for it to change its industrial might in less than 50 years.

It may be argued that Russia bore the burden of different nationalities and was a very large state, but so is America. America has been a melting pot of nationalities from day one. One of the major weaknesses of the Russian economy was the absence of a group between the ruler and the ruled, that is, the no-

bility, the church, the merchants, the businessmen, the group that would push forward its modernization programmes. During the early industrialization phase at the turn of the century, most of the capital for industries came from foreign loans. Though the aims of government policy changed drastically after 1917, the style, the substance and shape of government remained the same. Political life was dominated by a single centralized institution with a handful of individuals who had arbitrary power undisturbed by law.

All power in what was until recently the Soviet Union was vested in leaders who were leaders not only of the nation but also of the only political party. All appointments—political, public administration and academic—were determined through the central leadership and the high command. They chose people for colleges, universities, industries, factories, hospitals, R&D institutions and even small department stores. There was no organized civil service that could maintain a non-partisan, non-political role in decision making and development.

It must have been because of this and many other similar considerations that the Soviet leadership concluded that partial small measures and patchwork would not do. Unless there is a change to overhaul social, political, economic and administrative areas, the old systems will reject anything new that comes in bits and pieces. The leadership, therefore, was clear that the reforms would have to come from the top. And they would have to come in every sphere of activity. These reforms would also have to be backed by modern democracy for the people to participate in decision making. Switching to a self-governing system would enhance people's participation in management to give reform a further push. Measures of this kind in totality, with a broader perspective were not used in the past. It was only through these major bold initiatives for democratization that one could begin to restructure society at large—hence Perestroika.

Origin

Mikhail Gorbachov's succession to power in 1985 opened a new era not only for the Soviet Union, but for the whole world. For millions, Gorbachov was a hope, a vision of the future, a world view. He was the first modern Soviet leader who understood the imperatives of a scientific-technological age. In his approach to problems, he was pragmatic rather than idealistic. He was concerned. He was not a 'true believer' like Khrushchev with his egalitarian, utopian and socialist programmes. He rationalized, unlike a conservative bureaucrat like Brezhnev, who had concern only for the rights and privileges of fellow elite. His attempt was to restructure efficiently a system he had inherited. Glasnost was the soul of Gorbachov's effort to push through his revolutionary Perestroika (Restructuring) of Soviet social and economic life. He was determined and hopeful that he could shake the USSR out of a long period of stagnation.

The hard truth about the Soviet system is that the Stalinist system had been maturing for decades. With Gorbachov, the stresses and strains this system had developed became much more evident. In July 1986, Gorbachov himself de-

scribed 'restructuring' as nothing short of a revolution. It encompassed not only the economy but all other sides of society's life—social relations, political system, the spiritual and ideological sphere, the style and work methods of the party and of all cadres. Restructuring is a capacious word. It can be equated with revolution, a genuine revolution in the minds and hearts of the people, in the psychology and understanding of the present period, and above all in the tasks engendered by rapid scientific and technical progress.

Gorbachov's vision was integrated and holistic. He offered hope for a genuine change towards a more democratic future—a future in which the ordinary citizen would feel free to voice his opinion about the political processes affecting his life. In the report on Restructuring the Party's Personal Policy to the plenary session of the CPSU Central Committee on January 27, 1987, he said: 'Restructuring is reliance on the creative endeavour of the masses, all-round extension of democracy and socialist self-government, encouragement of initiative and self- organized activities, better discipline and order, greater openness, criticism and self-criticism in all fields of public life, and high respect for the value and dignity of the individual.' The economic side of Perestroika included a reduction in the role of central planning, decentralization of decision making, an expanded role for market mechanism and increased opportunities for private initiative in service and production. The political side included greater openness and publicity in the media (Glasnost), greater pluralism of opinion, elections for state bodies through secret ballot and an enhanced political role for workers in state enterprises through self-management and employee selection of managers and directors.

The emergence of Gorbachov and his Perestroika and Glasnost was a surprising development in a society that had known not a single day of genuine democracy. Various factors combined together to bring about the idea of change, democratization and grassroot participation in the institutions of governance. The economy had long stagnated leading to endless shortages and belying the rising hopes and aspirations for a workers' paradise. The economic slowdown was compounded by technological backwardness. This created a gap of profound political and psychological importance. It also separated the Soviet economy from the economies of other advanced industrializing societies. While, in the last 15 years, the application of new technologies on a large scale resulted in a tremendous expansion of productive forces in most capitalist nations, the Soviet Union was yet to create many prerequisites for this third industrial revolution, from a reliable telephone network to the much more complicated production of such primary electronic components as super miniaturized microchips.

By the end of the 1970s, some members of the Soviet political class and professionals were well aware of the revolution that was sweeping the West and the Far East. The third industrial revolution of the capitalist world was gearing up at the same time that the Soviet economic growth was slowing down. Excluding World War II, the decade from the mid-1970s to the mid-1980s was the

first prolonged period in Soviet history when the nation was falling behind the capitalist nations, according to the key economic indicators of growth. Most importantly, the technological gap between the Soviet Union and the advanced capitalist nations was sharply widening.

The higher one climbed up the bureaucratic ladder in the Communist Party of the Soviet Union, and in many socialist and developing nations as well, the more were the comforts paid for by public funds. As a result, one became more dependent on position, power, and perks. In the USSR a total of 40,000 senior party members enjoyed the privileges, preferences and perks such as special rations. There were special department stores in the Kremlin designed to serve these high level bureaucratic bosses. They were given facilities unavailable anywhere else in the city. These bosses enjoyed special furnished apartments, the services of housekeepers, limousines, bodyguards, cooks, special assistants, summer homes, weekend vacations and even custom-designed and specially tailored clothes.

None of these belonged to them; they never paid for them—they just enjoyed them while in service. All these marvellous things from dachas to long limousines belonged to the Soviet Government and just as the system gave these to them, it took them away from them when they retired. However, as part of the endless enjoyable experience, most bureaucrats and party bosses got used to them and began to think that these were permanent. In the process they almost forgot how common people lived—what it took to get telephone service, how one opened a bank account, how one paid electricity bills, etc. They failed to realize that it was not they who were being favoured but their position and power that went with it. Finally, when this realization came at the time of retirement, it was too late for them to switch over to normal lives.

Over a period of time, this system of privilege, perk and patronage had developed into a vested interest for those who enjoyed it. Times changed, technology and markets gave a new meaning to management methods, but the essence of this system remained the same in socialist and many developing nations. In Moscow, it was common to see people waiting in line at the stores to find empty shelves at the other end. Consumer products were in short supply and the consumer market was in chaos. Black market for some of these goods was open and visible everywhere on the streets. Any American tourist, wearing jeans and tennis shoes, was stopped by young men and asked to sell his clothes before going back to the States. There was a great craze for foreign consumer goods, mainly because 'Soviet' industry manufactured consumer goods of inferior quality. Even when goods were available, the supply and distribution systems were disorganized, and unpredictable. Glasnost publicized the fact that many consumer items were dumped at transit sites but remained unloaded for months due to shortage of trucks, trains or cargo space. Sometimes, consignments were not lifted until new orders came for delivery to another city, thus creating further shortages and confusion. These facts about consumer shortages were well known even during the time of Brezhnev, but it was only after Perestroika that

it became possible to raise questions related to inefficiency, shortages, sabotage and systems related to the old way of doing things.

Soviet Marxism proclaimed as its goal the creation of the new man. It is unlikely that the Marxist leaders foresaw the kind of 'new man' they were creating. In the 1980s, the Soviet work force lacked the qualities of adaptability and creativity essential for the successful running of a complex economy. The deteriorating Soviet economy, however, led to a dramatic change in people's attitude. The growing pessimism about the future and the regime's performance became a matter of concern for the Soviet society. The post-Stalin era was marked by rapid industrialization and urbanization of the Soviet Union. This transformed the passive inarticulate peasant society into an urban industrial society with an increasingly articulate and assertive middle class. Rapid urbanization was accompanied by a dramatic rise in the educational attainments of the Soviet population. In 1959, two-thirds of the Soviet population over the age of ten had no more than primary education. By 1986 almost two-thirds had completed secondary education. In 1986, 22 million Soviet citizens had higher education. The growth in the number of scientific workers was especially dramatic, from 1.5 million in 1950 to 15 million in 1986. In short, by the mid-1980s a large urban middle class, including a substantial professional scientific technical and cultural intelligentsia, had emerged as a major actor on the Soviet scene. In its potential, present-day Soviet society compares well with the society of any other industrial nation.

In any society, the socially dominant middle class defines the life style for society at large. The Soviet middle class, however, gradually became politically fragmented and powerless. The superimposition of a stagnant, conservative political leadership and a system where politics was in full command, and a society that was changing significantly, created a chasm between the regime and the society. The Soviet middle class felt increasingly frustrated by the gulf between its social status and its political and economic clout. It was politically vulnerable and isolated from the political elite.

Cultural repression led to an intense feeling of pessimism and hopelessness. Music, ballet and literature representing the most creative and independent spirit of man, were suppressed. The officially sanctioned or enforced artistic standards with their hollow subservient content could no longer hide the sense of deep cultural pessimism. This was reflected among the educated strata of society and workers. The Soviet Union was probably the only major nation in the world where the youth neither rebelled nor expressed any youthful enthusiasm that could be channelled into creative public endeavours. Their heroes were their own private poets and balladeers (in particular Vladimir Vysotsky) who were barely tolerated by the authorities; and their major public expression of dissatisfaction was the flaunting of the artifacts of Western mass culture, such as blue jeans and popular records, officially permitted but never encouraged. The virtual paralysis of an ageing leadership and the demoralization of an influential scientific, technical, and cultural intelligentsia constituted an important force for

reform. A whole spectrum of social maladies, from alcoholism, to drug addiction and crime were the escape from official control which reflected the significant dimension of the Soviet behaviour patterns.

Technological changes have created new tools of communication. Mass access to television rendered obsolete the traditional Soviet political socialization system. Whether in the burgeoning 'second economy' or in a blossoming popular culture—and facilitated by newly available technologies, from automobiles to VCRs, whose use is not readily amenable to central control—official norms and institutions were progressively supplanted by new forms of largely autonomous expressions responsive to the preferences of consumers rather than officials. Thus, the social technological and generational changes profoundly affected the values and expectations of the Soviet population.

The younger generation, regardless of their educational levels, became disposed to private economic activity, innovation and individual rights. A shift in expectations and energies broke the age old inertia and gradually created an intellectual and moral rationale for the increasing 'privatization' of Soviet life. The leadership in the post-Stalin era had failed to provide a direction to the emergence of new social forces. The much propagated image of revolution from above could not come to terms with the rising expectations and the realities of Soviet day to day life. Rather, these social forces attained a degree of autonomy and began to impinge actively on the political system. The transition from Stalin to Khrushchev marked a significant change of direction leading to a facing up to the 'cult of personality' and its consequences in the economic, political, historical and moral spheres. With continuity inscribed on its banner, the Brezhnev era ended in stagnation under what once again became a very personal style of rule. Despite substantial successes in foreign and armament policy during the 1970s, the nearly 20 year long Brezhnev period left unresolved and indeed compounded so many problems particularly in domestic policy and economy that expectations mounted both in the Soviet Union and abroad for a change in direction. The emergence of Gorbachov in the Kremlin and his strategy of Glasnost and Perestroika had their roots in these widespread political and social changes that created the context and force for systemic reforms in the Soviet Union.

Essence

Gorbachov said time and again that the centre point of his Perestroika was the Soviet citizen. Hence came the dedication to orient administrative and economic reforms towards benefiting the people by involving them to participate in the means of production, distribution and development. Perestroika consisted of building a human and democratic society with new economy and administration at all levels to improve the standard of living of Soviet citizens. Glasnost well publicized the intentions of the leadership. But translating these bold slogans into reality was an altogether different matter. Glasnost also publicized the fact

that Perestroika encountered immense difficulties and resistance at various levels from the old guard. In the process of restructuring, confusion and chaos was created at all levels.

One example of this relates to the crucial decision to minimize the production of vodka and other alcoholic beverages to discourage heavy drinking. The production of vodka and other hard drinks was a major industry in the Soviet Union. Many vineyards and breweries provided thousands of jobs. The decision to compel people to become teetotallers destroyed vineyards and created great confusion in the market-place. Black market flourished and many went underground. The attempt to revitalize the economy and shift the focus to consumer goods through such arbitrary moves created many distortions. Another example is defence expenditure. The fact that the defence industry did not require understanding of market forces and distribution channels had not been appreciated by the planners. In the consumer goods sector, it is not just the production that matters. The packaging, distribution, delivery, advertising and sales promotion are equally important.

Gorbachov's strategy of Perestroika (restructuring) was a call for radical changes. The essence of his strategy was not only a departure from past policies and practices across every area of Soviet economy, but also in social and cultural policy, in the nature of Soviet political life and ultimately in the allocation of status, power, and rewards throughout the Soviet system. On January 27, 1987 at the plenary meeting of the CPSU Central Committee, he said: 'Restructuring means the priority development of the social sphere, increasingly satisfying the Soviet people's requirements for adequate working and living conditions, recreational facilities, education and medical services. It means unfailing concern for raising the intellectual and cultural standards of every person and of society as a whole: it is the ability to combine decision making on the major problems of public life with that of the current issues of immediate interest to the people.' Gorbachov's obsession with 'glasnost', with cultural liberalization and democratization reflected a profound recognition of the need for a new social order. Soviet society had reached a level of maturity that required a new approach in its governance. The classes could no longer be treated as the objects of official policy, but as genuine subjects. It was finally being realized that successful reforms rest, at bottom, on redefining the relationships between State and Society.

In the economic area, the strategy was for acceleration (Uskorevic). The economic administration was to be geared up to arrest the stagnation and to introduce a self-sustaining process of technological innovation. For decades, the Soviet economy had been over-centralized. Gorbachov wanted reduction in central control and an increase in the role of enterprises and firms in self-management. The proposed reforms sought to encourage private initiative in agriculture and in services, where centralized planning had proven least effective, where the poor quality and limited availability of desired goods and services had been a perennial source of complaints, and where dependence on supplies from other

sectors was lower than in much of industry. In this sector, Gorbachov said, the precedent of Lenin's New Economic Policy of 1921 made ideological constraint less inhibiting.

As part of this scheme, the collective farm markets in urban areas were to be expanded, private or cooperative restaurants increased, cooperative housing construction encouraged and a network of establishments created to provide badly needed consumer services. Private initiative and responsibility at the enterprise level was to be encouraged. The competitive environment for work force and for the enterprise was calculated to increase productivity. The proposal also included a major revision of the wage structure and rewards for initiative and productivity and penalties for failures. The economic system was proposed to be modified to include market relationships in the framework of socialist commercial economy and utilize economic levers in place of administrative mechanism of control.

In industry, laws were to be enacted to give workers a say in how their factories were run, to make them more responsible for their own profits and losses. The workers were to be given the right to elect their managers and to have a say in the way their firms spent the money they earned. Gorbachov emphasized that economic incentives be used more widely so that workers were materially benefited for showing creative initiative and for increasing labour productivity.

Gorbachov also proposed initiating limited use of joint ventures with capitalist firms. This would draw Western capital, technology and management skills so as to improve the efficiency of Soviet enterprises. It would enable the Soviet Union to produce for international and internal markets, and at the same time, help her to meet the international standards of quality. In his Khabarovsk speech in August 1986, Gorbachov challenged the relevance of the Stalinist economic model and insisted that there would be no progress if they sought answers to new economic and technological questions in the experience of the 1930s, the 1940s or even the 1970s.

One of the important priorities of Gorbachov's strategy was his campaign for social renewal for the modernization and transformation of the Soviet Union. He tried to seek reconciliation between the regime and society. His first steps after assuming power were directed at strengthening social and particularly work discipline. Normative appeals, new laws and stricter enforcement of existing laws succeeded in part in improving social discipline. Gorbachov's campaign for anti- alcoholism and fight against official corruption were directed at commanding the attention of the Soviet population to the renewed social discipline so that it would restore confidence in the working class.

Gorbachov's advocacy of Glasnost was a symbol of trust and recognition of the potential of Soviet people. It was a call for nudging open a closed society, for forcing accountability on an industrial and political elite accustomed to covering up its failures, for galvanizing a younger generation grown cynical about the promise of the worker's paradise. The reforms in cultural and communication fields marked the beginning of the political and professional eman-

cipation of Soviet creative intelligentsia. A more independent role for the media and serious investigative reporting were important instruments for exposing abuse of power and position. In a marked break with the past, detailed statistics were published confirming dismal harvests and unsettling infant mortality rates. Alcoholism, drug abuse and prostitution became topics of frank public discussion. After the initial secrecy surrounding the Chernobyl nuclear meltdown, the official press carried detailed coverage of a round of Soviet disasters, from earthquakes and shipwrecks to hijacking, airplane crashes, drug busts and even traffic accidents.

Gorbachov's new thinking and its implementation were developing the elements of civil society. A significant degree of autonomy to trade unions, professional groups, and cultural associations not only reversed the post-Stalin patterns but also signified the retreat from some highly authoritarian aspects of Leninism. At the Central Committee Plenum in January 1987, he criticized the schematic and dogmatic approach to party ideology that was the characteristic of the past and encouraged a more tolerant and encompassing approach to ideology. Acknowledging that the nation's needs had fundamentally changed, he challenged the persistence of theoretical concepts of the 1930s and 1940s. In one of his speeches he said: 'We must get used to the idea that a multiplicity of voices is a natural part of openness. We must learn to live under democratic conditions.'

The most fundamental dimension of Gorbachov's strategy was the promise of a dramatic move towards democracy. Serious and deep democratization of society was the much emphasized goal of his leadership. The striking evolution of Gorbachov's thinking during his first two years was manifested in his dramatic speech to the January 1987 plenum of the Central Committee, in which he argued that economic progress and social renewal ultimately depended on political democratization. Without a greater sense of participation and active engagement in the process by the people, the reform strategy would not be fully effective.

His democratization involved more extensive involvement in grassroot economic and political life, discussions of problems at the work place and in local state and party organizations, and accountability by leaders. Gorbachov advanced proposals for political democratization that went far beyond the limits of traditional Marxism-Leninism. Not only did he propose to allow citizens to nominate several candidates in general elections, a measure already practised in Hungary, but he suggested that even party officials from the secretaries of local organizations up to the Central Committee in republics be elected by secret ballot from among an unlimited number of candidates. Gorbachov also suggested that heads of enterprises, heads of shops, departmental heads, even farm chairman would be elected rather than placed in position from outside. This would create scope for men and women of proven ability to compete for leadership through secret ballot rather than by traditional show of hands only to confirm decisions arrived at behind the scenes.

For the first time, the principle of accountability of communist leaders to party members was envisaged, making their election dependent on their performance and prestige as determined by ordinary party members. This was a far cry from the existing system, where both nomination and evaluation of such leaders' performance were decided by superior party officials. It was top to bottom selection of local leaders that had generated bureaucratization and sycophancy towards the top leadership in communist parties. For Gorbachov, democratization was not simply a slogan, but the very essence of the restructuring of the whole Soviet society. It was a vision of an order that was an organic combination of democracy and discipline, of independence and responsibility, of the rights and duties of every citizen.

He repeatedly asserted that democracy was not the opposite of order. It was order on a higher level, based not on unquestioning obedience or mindless execution of instructions, but on active equal participation by all members of society in all its affairs. It was conscious discipline and organization of working people based on a sense of really being the masters of the nation, on collectivism and solidarity of the interests and efforts of all citizens. Democracy meant society exercising self- control, based on confidence in the people's civic maturity and awareness of social duty. Democracy also meant uniting rights and duties.

The process of Soviet liberalization started with the release of the noted Soviet dissident scientist Andrei Sakharov from his seven-year- long internal exile. It was also proposed to establish a commission to review the cases of all political prisoners serving sentences of internal exile. These developments show Gorbachov's loyalty to innovation, though democracy and decentralization are bound to generate a crisis at domestic level.

During 1987, I visited the Soviet Union for the first time. Having lived in the US for over two decades I had formed certain impressions about life in the USSR. These impressions and images were based on media propaganda and the concept of Communism derived from the experience of the last world war and the ongoing Cold War. We were to meet people in Moscow responsible for organizing technology exhibitions and negotiate terms and conditions.

I was to fly Aeroflot at about midnight from Delhi. At the airport, a large crowd still waited at the Aeroflot counter, half an hour before flight time. People were still checking in large baggages and carrying lots of hand bags. There was confusion and chaos. Almost all the Soviet passengers were carrying utensils, food supplies, electric appliances and other consumer products.

It was my first Aeroflot flight. Almost half of the first class seats carried baggage. A week ago, I had been told that all flights to Moscow had been booked because of the heavy traffic resulting from the Festival of India. Never had I seen baggage dumped on first class seats and secured with seat belts. While taking off, the plane made a lot of noise. I learnt later that the noise came from the carry on baggage compartment just below the first class. On the way, there was no smile or service to speak of.

There was an hour-long stopover at Tashkent. We were asked to deplane and move to a waiting area. The airport was as dull as you could find. There was hardly any airline staff. All the soft drink bottles were opened in advance and everyone was supposed to take one. From the arrangements at the airport, the waiting area, the airport construction, and the service it was apparent that we were not in an advanced nation. A lot of work still needed to be done to make Tashkent airport comparable to any other European or American airport.

Moscow airport was quite different. It was well built, well laid out and modern. I learnt that it was built by foreign contractors. Since we were on an official visit, we did not have to go through a lot of formalities. After filling in a few forms, we quickly got out of the airport. I was told that for other tourists a pack of cigarettes or a bottle of scotch could get almost anything through the customs without delays.

When we arrived at the Hotel Russia, one of the largest hotels in the world, we got a taste of Russian bureaucracy. Checking in there was quite a task. We had to turn in our passports and fill long forms before we were assigned rooms. There were no porters or bell captains and no smiles at the reception desk. The implicit message was that every hotel employee was doing us a favour. Somehow, I felt more like an intruder than a guest.

Hotel Russia is located near the Red Square and the Kremlin, and has over 6,000 rooms. From the reception desk, the walk to my room was almost a kilometre. Going through various alleys, I finally located my room which was small, clean, simple but expensive. It was early morning. So rather than rest, I decided to shower and was ready for a cup of tea. I looked in my telephone directory to call room service. Nobody had briefed me that there was no such thing as room service at the hotel. You could not call in and order breakfast in your room. This was something new. Finally, waiting for my host I decided to look for the local telephone directory. When I called the hotel operator for this I was told that there were no local telephone directories, nor were there yellow pages. The logic was that if you want to call someone you should have his telephone number. And if you do not have the telephone number then why should you call him? The operator could hardly speak any English. I was totally at sea. Never had I been to a place where I felt helpless. Finally when our host arrived, we were told more about the hotel facilities. I also learnt that Soviet citizens were not allowed to enter the hotel without special permission. Guards at every gate ensured this. This was another shock. I could not believe that in your own nation you cannot enter a hotel building. These hotels were built specially for foreigners.

Our meeting at Vedenka was at around 10 o'clock. Black limousines, Chaykas, were ready with interpreters and we were on our way. This gave me an opportunity to see during the day the beautiful city of Moscow. I was much impressed with the old buildings and architecture. But everything seemed quiet and a bit dull and depressing.

I had been warned in India that the Soviets are tough negotiators, they would

not give in and we would have a hard time dealing with their labour arrangements. I was told that unless we were clear about details related to packaging, display, utilities, storage and transport our negotiations would be difficult. I was pleasantly surprised to find our Soviet counterparts were open, friendly, knowledgeable, resourceful and hard working. I saw in them warmth, concern and willingness to help at every step. They were more receptive to new ideas than I had expected. They were clearer about what we needed than we were. Our negotiations went on for a couple of days. In the meantime, I got to know a little more about the Soviet system through shopping centres, hotels and restaurants, and also had a brief tour of the city.

I learnt that there was a large bureaucracy in the USSR. There were lots of rules and restrictions. The environment was dull, and shops were empty. Though people were very friendly and open they were afraid to speak up. If during our interactions I started probing individuals and institutions, they grew very cold. People wanted to open up, but for some reason, they could not. They were constantly looking at the head of the table to get signals on what to say, when to say and how much to say. The management hierarchy was visibly apparent at the conference table. The arrangements at the hotels had to be elaborate and needed to be worked out in advance. Even the lunch had to be worked out much in advance. We could not just walk into any restaurant and order a meal. The map that I had, did not tally with the street signs I saw. The city was poorly illuminated. There were not many shopping centres with neon signs or restaurants to go wandering about.

One evening we were on our own. We had quite a difficult time finding a place to eat. Finally one of our associates, who had been to Moscow before, suggested a place. At the restaurant we were told in broken English that there was no room. We told the manager that we would wait but he still said no to us. He said, 'Even if you wait, there is no way we can serve you, we are all booked.' Finally, my colleague slipped in a five dollar bill and all of a sudden there was space and we were warmly welcomed. Inside, there were a lot of vacant seats. But we sat there for half an hour before anyone would take orders. No one really cared about serving anybody. It was quite a scene. I had felt the warmth, friendship, and hospitality of the Soviet people but I experienced sheer apathy towards customer service.

My next trip was to Leningrad (now St. Petersburg). We arrived early morning at the Moscow Airport from Delhi. The train to Leningrad being in the evening, we decided to spend the day sight seeing and visiting exhibition halls at Vedenka on space, energy, engineering products, tools and machinery. From the exhibition, it was evident that a great many things had been accomplished by the Soviets in space, energy and heavy industries. They were mighty proud of their achievements in these areas. These developments largely benefited the state directly but not the people.

The train journey to Leningrad was comfortable. In the early morning light next day, the vast land was visible only once in a while, mainly due to dense

tree cover alongside the railway tracks. From the condition of homes, roads and vehicles it appeared that modernization had not yet transformed this part of rural Russia. These villages from a distance seemed just a shade better than Indian villages with their peasants, poverty, heat and dust.

Our hotel at Leningrad was a modern fancy hotel built by foreign contractors. It was on the ocean front in a beautiful setting. Our exhibition needed a fair amount of preparatory work, and I got down to work with my colleagues fixing the panels and exhibits. When I started lifting large panels and packages many of the Soviet officers were puzzled. They also have a hierarchical work culture as in India. They could not believe that one of the key executives would start fixing panels, hammering nails and cleaning displays.

We worked till late in the evening and finally went to the ocean front at 11 p.m. to see the sun set. It was around September, when the sun sets at Leningrad at midnight. It was a breath-taking sight.

Early next morning, we were pleasantly surprised to see a mile-long queue of people waiting to enter our exhibition hall. After a brief inauguration ceremony, the entire hall was full of people eager to learn more about our technology and products. The children showed a great deal of interest regarding computer games, something they had no access to at home or school. It was hard to get them off the terminals. Housewives and women were interested only in the consumer section of the exhibits. They were constantly staring at leather goods, carpets, perfumes, clothing, utensils and appliances.

This was my first exposure to a large group of Soviet faces, expressions and preferences. Everyone could sense that they were starving for consumer products. They were constantly asking questions on prices, availability, quality, capacity etc. Some went so far as to ask whether these goods could be either sold right then or could be purchased after the exhibition was over. People working with us on the exhibition also had their eye on several of the consumer products. They had already made their deal to keep some of these products for themselves at the end of the last exhibition in Tashkent. I saw one woman negotiating for a refrigerator with one of my Indian colleagues who of course said that all this equipment and appliances were on loan and must go back to India. The first exhibition was a great success. Over 5,000 people came to visit on the opening day.

Leningrad is a beautiful city with a long history and heritage. For centuries, it has been known as a seat of power. It has seen the power of Peter the Great, the revolution of Lenin and the starvation and human suffering during the war. I visited the Hermitage, one of the greatest art museums I had ever seen. It took us almost four hours just to walk through thousands of paintings, sculptures and artifacts. Never had I seen so many paintings of Rembrandt, Michelangelo and others in one place. When I returned to my hotel I felt like closing my eyes for the next 10 days just to go through those paintings once again. The next day at a formal dinner I met one of the finest violin players. Upon returning to India I contacted one of my friends in the US for arranging a possible concert tour

for him to the Midwest. We tried very hard to locate him at the hotel but there was no response from him and nobody was willing to give any information. I was told that even if I contacted him, he might not be able to accept our offer and invitation to tour the US.

The second exhibition was in Moscow during November. By now, I had made some friends who were open and bold enough to share their views and speak their mind on the Soviet system. I was curious to visit their homes. I even tried to get an invitation from some, but it was difficult. Once, waiting at a hotel lobby I decided to take a taxi and go wandering around. I had been told not to do this because I had a chauffeur driven limousine assigned to me, but with all the people around me, I felt uncomfortable and suffocated. When I returned to the hotel after about 30 minutes I realized that I had created a minor commotion. They were all worried about me and my whereabouts.

This time we were staying at Hotel Ukrain, which is a monument in itself. For some of my vegetarian colleagues food was a major problem in the Soviet Union. For me, I enjoyed eating caviar—for breakfast, lunch and dinner along with other great Russian dishes. Our vegetarian colleagues were happy during this visit because an Indian restaurant called Delhi had just opened in Moscow. Delhi Restaurant is the first joint venture of Indian public sector hotels with the Soviets. While we were in Moscow, Delhi Restaurant was the talk of the town and was considered one of the places to visit for foreign tourists.

Eating out used to be a serious problem in Moscow. I have personally seen it change in the last few years. During my first trip, it was almost impossible to find by yourself a good place to eat. Now there are many good restaurants and cafes. Recently a friend came back from Moscow and when I asked him about the most interesting part of his visit, he mentioned MacDonald's Hamburger. People, he said, were lining up for two miles waiting for a cheeseburger. He spoke to some of them who had waited for six hours for french fries and milk shake. This essentially sums up the craving for consumer and perishable goods in the Soviet system. No other system that I know of has the kind of shortages the Soviet system has when it comes to consumer goods. Wherever you go you find people lining up to buy something or the other. I am told that very often people just get in a line without really knowing what is being sold at the other end. When their turn comes they buy whatever is available and sometimes move on to the next line. I have seen people selling vodka in the black market outside a hotel at midnight and ten people lined up to buy it.

During our third and last exhibition in Tashkent, I was exposed to a totally different world of Soviet Nationalities. Even though Tashkent is almost three hours flight from Delhi, because of Soviet rules and regulations, I had to fly via Moscow. This time I had to fly to Moscow via Frankfurt, a nearly ten-hour flight and then from Moscow to Tashkent another four hours. Tashkent is a city full of Muslim culture. It has had historic links with India from the days of Taimur Lung. Everywhere we received warm hospitality and were treated like old friends. The local people even spoke some Indian words. They were very fond

of Indian music and Hindi film songs. Every taxi driver kept his radio on listening to Hindi songs.

In Tashkent, I was interviewed for a television programme regarding our exhibition. The interviewer turned out to be better at Hindi than I was. She was intimately familiar with Indian customs, culture, geography etc. Talking to her and seeing the affection and love for India in the local community I suddenly realized why India had long lasting relationship with the Soviets. Sharing common borders with us, the people of the region share with us some amount of common culture. These national borders serve as membranes to filter and assimilate lifestyles on both sides of the fence. In the studio, when I started discussing these and other related issues, someone quietly said, 'Mr. Pitroda, if the Himalayan mountains had not been around as natural barriers, the history and geography of this region would have been different.' I said, 'How do you mean?' The answer was: 'We would have been perhaps a part of India because we have a lot more in common with you than with our bosses in Moscow.'

During my numerous other trips, I had an opportunity to meet some of the key science advisers to Gorbachov. I found all of them to be very modern, energetic and with a vision of the modern technology needed to reshape the future of the Soviet Union. With some of them I spent hours together. Their knowledge of the Western state-of-the-art technology always impressed me. Academicians are a special breed of people in the Soviet Union. I am told there are only around 500 academicians, comprising scientists, engineers, authors and artists who form a special class of privilegentsia. They get special living accommodation, exorbitant salary and many perks and privileges.

However, I found the entrepreneurial and management skill to translate technology into products and markets lacking even among top scientists and engineers. Understanding of the consumer market and an entrepreneurial environment is essential to capitalize on the modern technologies and products for the masses. In spite of all their scientific knowledge, I feel that the Soviet experts will have a very difficult time in acquiring the entrepreneurial instinct that is essential for transferring the forces of a centrally planned system to free market and global competition. It is the gut feeling for market dynamics and decision making that matters in the rapidly changing technological world. This cannot be acquired just by reading books and attending lectures. It will definitely need a handful of key advisers from outside the system who have had first hand living experiences in the capitalist world.

During my subsequent trips after the Festival of India, I found a drastic change in the Soviet system. I am sure that the change has been evolutionary in the last five years. However, it was more visible in the attitudes of the people in the last year or so. I found people to be more open and ready to invite you to their homes. I was invited to a Dacha just outside the Moscow Airport where I had a taste of the upper middle class lifestyle in a Moscow suburb. It was a beautiful building, a two storeyed house on an acre of land being used as a second home only for weekends. Now during normal conversation people were

more critical of the Soviet system. They were interested in discussing politics openly and were hoping for better days ahead. They were curious about our views on Perestroika and ready to have a dialogue on the future of reforms in the Soviet Union and Eastern Europe. They were openly praising the Western economy and were interested in travelling to see other parts of the globe.

Just in the short span of one year, I also saw a large number of small cafes on the roadside. In fact, in Moscow almost a mile long street has now been dedicated during summer to the local artists and street vendors to exhibit modern paintings, artifacts etc. and even sell food and gifts on the roadside. Two years ago, I could not imagine a young musician singing Western songs with his guitar on Moscow streets and the painter painting on the roadside nude and abstract paintings. This transformation has been slow but sudden on Moscow streets.

During one of these trips, I also had an opportunity to visit the electronic city near Moscow where over 50,000 people work with a massive infrastructure of their own. They were just setting up a large factory to produce floppy discs. The entire plant looked modern and used a lot of imported equipment and machinery. From my interactions with them I found that as in many developing nations they were more concerned about setting up a large infrastructure with buildings, machinery, posts and positions than products, productivity, efficiency, competitiveness and cost reduction.

Gorbachov: The Man

On March 11, 1985, the Central Committee of the Communist Party of the Soviet Union met to elect their new General Secretary to succeed Chernenko who had died the previous day at the age of 73. Against all expectations, the man they selected was 54 year old Mikhail Gorbachov, an energetic younger man to lead the party and the nation. Everyone, including ordinary Soviet citizens, government officers, party workers and even observers from abroad expected that the successor would be as elderly as Chernenko, mainly because the entire Politburo has always been ruled by statesmen over 65 years of age. It was surprising that in spite of reluctance on the part of the older generation of Soviet leaders, their younger colleague was trusted to take charge. It was indeed a signal to begin a new era in the Soviet system.

Mikhail Gorbachov was born on March 2, 1931 in Privolnoye, a small village near Stavropol in the southern Caucasus region. His father was an agricultural mechanic. This gave Gorbachov the working class background which is considered appropriate and essential for a Soviet leader. The area where Gorbachov was born bears many resemblances to the American West. It was permanently settled during the latter part of the nineteenth century and over the years attracted Greeks, Georgians, Armenians, as well as Russians. With natural terrain, rivers, valleys and hills, people lived pioneers' lives in the traditional cowboy style. The Gorbachov family came from peasant stock and had to struggle to earn their livelihood. For them life was difficult and hard.

During the 1930s, Stalin's government introduced collective farming in the Soviet Union to bring agriculture under state control. Stalin and his advisers hoped that collectivization would provide the Soviet Union with sufficient agricultural produce which was badly needed to feed the millions and would perhaps also yield a surplus for earning foreign exchange. The entire campaign was originally aimed at private farmers who resisted it strongly. Millions burned their crops, destroyed their farms, slaughtered their livestock and refused to join with the concept of collective farming. All this must have had some impact on the young Gorbachov. He and his family must have suffered along with other Russians a great deal during the war.

The end of the war ushered in normal life again enabling Mikhail Gorbachov to continue his education. His father always encouraged him to study and work hard to build a strong foundation for his future. While at school, he had also to work on the farm during harvesting. In the 1950s Gorbachov had a major break. He was admitted to the Moscow State University and as a result moved from Stavropol to the centre of power. At the Moscow University, he was enrolled in the Law School. Though an average student, he had achieved recognition as a young campus politician. By the time he reached his senior year, he was elected head of the organization closely controlled by the party at the Moscow University. By then Stalin had died and a new era in the history of the Soviet Union was unfolding with many opportunities for realignment because of the in-fighting that followed Stalin's death and Khrushchev's emergence. In 1955, Gorbachov was sent back to Stavropol as deputy head of the Agitation and Propaganda Department. There he married Raisa Maksimovna, a philosophy student at the university.

Further advancement came in 1962 when he was appointed head of the Party Organization in the Stavropol Party Committee. During this time, he continued to concentrate on agricultural affairs in the region. At Stalin's behest, agriculture had been strictly controlled by the state and very little personal farming was practicable. After Stalin's death, Khrushchev started concentrating on advanced agricultural methods. During these years, Gorbachov became chief of the Agricultural Department of the region. While Gorbachov was working in a small area to improve agricultural productivity, Khrushchev was concentrating more on boosting agricultural output for the entire nation.

During 1964, while Khrushchev was holidaying at his retreat on the Black Sea, he was voted out of power by Brezhnev. During this period Gorbachov climbed up several rungs on the ladder of the party hierarchy and also received his degree in Agriculture in 1967. Gorbachov was the first Soviet leader after Lenin to have the law degree and the first ever to hold a degree in Agricultural Science and Management. During this time, he also started making his way to the more influential central organization of the party. In the 1970s, he became deputy to the Council of the Union of the Supreme Soviet. In 1971, he was nominated a member of the Central Committee and was officially admitted to the inner circle.

Kulakov's sudden death in the 1970s left the agricultural portfolio at the national level rudderless. No one was available to take up this responsibility. In November 1978, Gorbachov was made Central Committee Agricultural Secretary. In this job, he worked very hard to understand the problems of farmers from various regions. After he took over the job, production dropped significantly and the nation was forced to use valuable foreign exchange to procure foodgrains from the US, Canada and elsewhere. In spite of heavy investment in agriculture, the Soviet people were producing far less foodgrains per hectare than Americans and Canadians. At the same time, private plots, though they accounted for only five per cent of the Soviet land, produced 25 per cent of the total agricultural output including 50 per cent of potatoes. Though individuals did not own these plots, they were able to cultivate these lands as per their plans as opposed to state plans. Private productivity was high because of individual flexibility, freedom, entrepreneurial initiatives and profit motive. Gorbachov must have recognized the importance of individual initiative to increase agricultural productivity and other consumer goods and services.

In spite of poor performance in agriculture, on November 17, 1979, Gorbachov was promoted to membership of the Politburo, an organization of a handful of the elite that actually ran the country.

On November 10, 1982 Brezhnev died and Yuri Andropov took over as the chief. On February 9, 1984, Andropov also died after a long illness and 72 year old Chernenko, who was a close associate of Brezhnev, took over. In March 1985, after 13 months in office, Chernenko also died. Two key leaders had thus died within a span of 13 months. Both remained in office for around 14 months each. Perhaps because of this awareness, rather than select a man in his 70s the Politburo decided to select a younger man who would live to lead the Soviet Union into the twenty-first century. And they selected 54 year old Gorbachov as their leader.

From the moment he came to power, Gorbachov made it clear that he would have to transform the Soviet system and get it moving to increase productivity and efficiency. It was time to put into practice what he had learnt during his agricultural assignments and observed from his various trips abroad about private initiatives. This was the unique opportunity in history to bring the Soviet system in line with the best in the world. The standard of living could be improved for millions by moving on to the new battlefield of new technology and new markets the world over. This required not just understanding of agricultural productivity but whole new initiatives on social, political and economic restructuring.

It would appear as if Mikhail Gorbachov was born to save the Soviet Union by transforming it, with his own personal courage and conviction, into a large democratic society with vitality and vigour for the twenty- first century. He was determined to transform his centrally planned economy slowly into a free market-based system that would have great significance to the world economy. Like Franklin Roosevelt, he also realized that his nation needed bold initiatives with clarity of purpose and ability to move forward in spite of growing resistance.

The key was to try it; and if it failed, admit it and do something different the next time.

Gorbachov has been declared the Man of the Decade by *Time* magazine. He has become a hero and a cult figure in the last few years for many not only in the communist world, but also in the capitalist world. Gorbachov was seen by many as a political genius with a strong sense of purpose, decisiveness, and clarity of vision. He brought hope to millions in the Soviet Union and East European nations. He indeed was a strong leader with great leadership qualities. He had the ability to fashion a vision about the way things need to be in the future in order to overcome present difficulties. He also had the ability to communicate and sell this vision down the line to motivate those responsible for implementing his initiatives and associated changes. He had the unique quality of clarifying responsibility in such a way that each and every member of the team was clear about what was expected of him and how the overall vision would unfold. He was able to translate political intent into managerial policy and then motivate the people to find ways to make these policies a reality.

In the past few years, Gorbachov was solely responsible for driving the implementation process of change that was so much a part of his own new policies and new programmes. He was frank, open and honest about his assessment of the situation. He gave the impression that he had many answers and had an equally large number of questions. He had the ability to focus on key issues and disregard all that was less important. He seemed to have a short-term plan and also a long-term one. On his plan he seemed to have well-worked-out strategies which essentially unfolded in the last few years to the surprise of many of his partymen.

He understood that he could be a true leader only when he could encourage his people to face the realities and the truth about themselves and their society. The Soviet people had been used to bureaucratic lies. Talking straight to them meant a shock for the system. It appeared as if he had decided to dismantle the entire Soviet empire created in the past 70 years and transform it into a new modern society comparable to the best in the world.

Gorbachov was a great communicator and he adopted many key words to communicate his concepts. He had apparently learned a lot from modern information systems about openness, accountability, Perestroika, security, interdependence, and other buzz words. He was able to communicate the deeper meanings of each of these words to large groups of people around him. Besides good communication his sense of timing also was excellent. He was able to time event after event properly whether it was holding local elections, asking the Politburo to give him a vote of confidence, planning a summit with the US President or visiting Eastern European nations. He learnt the art of managing opposition as also his own well-wishers. At times, he was authoritarian, though he constantly harped on democratic values and democratic norms.

Many have said that Gorbachov was a world class leader, unequalled. After having studied the Russian system for several decades, he must have come to

the conclusion that to make Russia a significant power in the twenty-first century, he must improve the standard of living of its people. He must then not only create a long-term vision for his people, but also take charge to dismantle systematically the existing system to create new economic and social institutions in order to bring about changes in every aspect of life in Russia.

Gorbachov used television as a political weapon. On television, he had a superb presence—smiling, showing emotion, anger, concern, love for his people and total commitment to what he believed in and the task he had in front of him. As a result he was deemed indispensable by many of his rivals. His sense of mission came out loud and clear during his speeches on television, radio and in public. He was a master strategist employing superb tactics while handling events, institutions, and people. He was a product of the modern world and understood and appreciated the value of good information and good communication.

It is difficult to view Gorbachov only through Western binoculars. Democracy with its freedom of speech, freedom of expression, open politics and public demonstrations is a cherished idea in the West. But in Russia a strong leadership, usually in the form of a Czar who wielded almost all mystical power, is a tradition which will take a long time to die. When the Western world was praising Gorbachov, the Russian world was worried and concerned about its economy.

At times it is fair to compare Gorbachov's initiatives with those of Roosevelt. When Roosevelt took office as President of the United States in early March 1933, he inherited a terrible financial crisis in addition to the Great Depression. Only in a few weeks' time he had to make some hard decisions to get the nation out of trouble. Roosevelt requested Congress to give him full powers to deal with agriculture, industry and finance. Recognizing the grave consequences of the national crisis, Congress gave him all the powers to become virtually a dictator. With these powers, he was ready to shake up the nation and bring a feeling of confidence back among the masses.

He made a major decision to support farmers with huge subsidies in a multi-billion dollar Government funding programme. He also recruited a large work force for forestry to relieve unemployment. He encouraged a large number of people to build community assets under the unemployment relief programme and set up enormous multi-million dollar funds for special public works programmes. In the process, he also allowed the American dollar to fall. Roosevelt's main strategy was to increase the purchasing power of the people. He felt that with excess money they would be able to buy products and services which would create more jobs within the community and drive away depression automatically. This was exactly opposite to the usual approach where during a crisis leaders concentrate on cutting down wages to make goods cheaper. Roosevelt's strategy was to create markets by giving the people financial power to buy. Even in those days, Roosevelt's Government granted the Soviet Union huge loans for buying American cotton. They were even prepared to discuss the fea-

sibility of large-scale barter between the two nations. Though America has been a purely capitalist society with unrestricted competition, Roosevelt's approach was more socialistic, because he did introduce a great deal of state control. In a sense, America tried to use the socialist approach to get out of its crisis in the 1930s. Now the Soviet Union is using the capitalistic approach to get out of the crisis in the 1990s.

Conversation with Gorbachov: Gorbachov was visiting India during November 1988 to receive the Indira Gandhi Award for peace. I had a strong desire to meet him.

One morning after a brief talk with the Prime Minister, Rajiv Gandhi, we thought it would be a good idea to give Gorbachov a brief presentation on the potential of new generation technologies, specially technologies related to information, bio-technology and materials. Two of my senior colleagues and I decided to get ready in anticipation of a potential meeting. We worked for a few days to put together a complete presentation with 35 mm slides in both English and Russian.

A day before his arrival, we had a brief review with an academician, Ocipian, one of the key science and technology advisers in Gorbachov's team. During our presentation, we saw a spark in his eyes. Ocipian thought this was indeed an interesting presentation on the subject and Gorbachov would enjoy listening to it. The same day we had a brief review with the Prime Minister and some important officers. Everyone liked our presentation including the Indian Ambassador to USSR, T. N. Kaul. But still there was no appointment fixed. Finally we thought that the ideal time for the presentation could be at 10.30 p.m. after the private dinner for Mr. and Mrs. Gorbachov at the residence of Mr. and Mrs. Rajiv Gandhi.

My first interaction with the man I believed was a great communicator and motivator was at the dinner hosted for the visiting dignitary by the President of India, to which my wife and I were invited. His handshake was firm and strong. He maintained a direct eye to eye contact with every interlocutor. From brief interactions at the dinner it was clear that the Soviet leader and his team were in tune with trade and technology issues. They all spoke a common language and played the same tune on restructuring and modernization.

Our presentation finally materialized at the Prime Minister's house at 10.30 p.m. the next day. It was a small group—Gorbachov and Rajiv Gandhi, me and my two colleagues, the interpreter and Academician Ocipian. I believe that our Prime Minister had told Gorbachov that while having a cup of coffee after dinner, he would have an opportunity to hear a brief 15 minute presentation on information and other technologies.

I started our presentation with the usual comment that no other technology in human history had the impact that future information technology will have on our work, homes and offices. I talked about concepts related to openness, accountability, accessibility, connectivity, entrepreneurship, innovation, venture

capital, management, marketing and many other related issues. He listened carefully and asked probing and interesting questions. At one point I asked him, 'Do you feel that your Perestroika has its roots in information technology?' He smiled and said through his interpreter, 'It looks like it.' To provoke him once I even said that from my interactions with people in the USSR, I found that there was very little understanding of the cost, efficiency, and productivity as it related to competitiveness in world markets. I said, 'Without this it is difficult to compete in the global market.' His response was, 'Yes, we recognize that we have a lot of work ahead of us in this area.' My presentation and his expressions and inquiries reconfirmed my belief that Perestroika did have roots in technology and in particular modern information and consumer related technologies.

While discussing biotechnology, we talked of tissue culture and cardamom. He asked, 'What does cardamom look like?' Instantly Rajiv Gandhi asked his daughter Priyanka to get some cardamom from home. When Priyanka returned with a small dish full of cardamoms, I asked him to open one and try it out. While discussing tissue culture he seemed very interested in micro-potatoes, cabbage and other agricultural activities. He mentioned that he was a man of agriculture and took special interest in it. The presentation, which was supposed to take 15 minutes, ultimately took 90 minutes. In between we had coffee, juice and a lot of interesting interaction. At one point, I said that people in the USSR did not know enough about modern management methods. My colleagues perhaps felt that I was overstepping the mark. But I simply wanted to see his reaction and response to these bare facts. Our long discussions projected the concern of both leaders for world trends, technologies, problems and prospects. It was clear that both were interested in larger goals transcending their personal interests and their nations' interest.

At the end, the question arose: where do we go from here? What do we do with these things? I expected him to leave it open. Instead, he immediately identified three major milestones and said that a team of USSR experts would come to have further discussion on these issues within the next 60 days. By January 27, experts visited to witness the same presentation that we had given to Gorbachov and for possible follow-ups.

This 90-minute interaction with the man convinced me that he was clear, concise, committed and concerned about the world at large. He was looking beyond Russia and Russians. He saw in the presentation an opportunity to learn and interact, which like any other good leader he seemed to enjoy. It was clear that he was indeed determined to bring about generational changes. He was not afraid to ask questions and to comment. He made everyone of us feel comfortable. After the meeting, my respect for the man went up significantly.

Gorbachov: The Phenomenon

Ever since Gorbachov appeared on the Soviet central stage in 1985, momentous changes have taken place not only in the Soviet Union, but also in the entire

Eastern Europe. Contrary to popular belief, he exercised considerable influence in the Soviet Union even before 1985. However, with his initiative on Perestroika, he consolidated his position, influenced the top party leadership, impressed the world community and took bold steps to implement reforms in many critical areas. In the process, he developed a style of functioning with clarity and vision for a road map to reform in the near future. He was open, sincere and committed to his vision of the future. This galvanized other socialist nations of Eastern Europe. He gave them an unspoken clearance and clarity they needed to move towards democracy.

Gorbachov did what a rare transformational leader could possibly do to create conditions of reform and restructuring that could find roots in the system and motivate a large number of people to push and perform. As a result, the Gorbachov initiative became a phenomenon which caught on quickly like wild fire all over Eastern Europe. No one ever expected that freedom would explode so soon and so far. The Gorbachov phenomenon has, for the first time in history, raised questions about ideology, economy, institutions and even national boundaries. His approach was to free the thought process, clear the air and begin to experiment and find many more answers as you proceed.

At the time, the situation in the entire Eastern Europe was hotting up. Pressure was building up during the last decade and needed proper timing and tempo to release the energy. The Gorbachov phenomenon provided this timing to have free elections, liberalize economic policies and reunify East and West Germany. The new phenomenon was responsible for the process of change set in motion by one man with a vision, courage and boldness who recognized that he did not have all the answers, but was willing to learn through trial and error. He was ready to build on what was initiated and sustain what was being achieved.

At this stage, the phenomenon has overtaken the individual who initiated it. Now the momentum has picked up to a point where the individual is dispensable and redundant. The system has gone far enough to accept a new federation with total autonomy for various nationalities and Baltic Republics. Many have climbed his bandwagon and are now prepared to carry it forward. New local leaders have emerged with added commitment to reform, some saying that Gorbachov was not moving fast enough. It is this sustenance from the top to bottom that has made the Gorbachov phenomenon unique in recent history.

Perestroika has been so well packaged and presented to the socialist and the Western world that everyone has a stake in it. Everyone wants it to succeed. In the Soviet Union, in spite of rising consumer prices, demonstrations and unrest, there is no going back. The East European nations also have gone far enough to question the process and the programme. The Germans have already accomplished what they thought might take decades to achieve. The Western world also sees in it a prospect for peace and end of the Cold War. In other words, everyone expects to win by supporting what Gorbachov initiated. It is in everyone's interest to make sure that his ideas succeed against all odds.

Similar initiatives were taken in other parts of the world as well. China started

its four-phase modernization programme a decade ago. India initiated liberalization of the economy in the mid-1980s. Brazil also tried a new package of reforms. However, none of these could sustain public imagination and lost the momentum along the way, partly because these initiatives were not complete. They were small patches on the established system. They did not integrate various dimensions to total reforms.

The Gorbachov phenomenon has no parallel in history. No one man could have initiated in peace-time reforms which would ultimately change the lives of over 400 million people in the Soviet Union and Eastern Europe and in the process open up a whole new market as big as United Europe or the US. It started as part of a restructuring plan by a new young leader and may perhaps end up with a plan to restructure the entire world politics and economy. It has the prospect of providing a foundation for peace and prosperity in the next century.

Coup of August 1991

I woke up at 8 in the morning at home in the US, fixed my bowl of cereal and turned on the T.V. "Gorbachov has been overthrown", announced the CNN newscaster. I could not believe it. I moved closer to the TV and watched scenes from Moscow. There was total chaos as bewildered Muscovites huddled in groups, failing to comprehend the changes. An hour later, the newscaster announced that the coup leader, Anatoly Lukyanov, would hold a news conference.

My first thought was that the coup-makers were no longer in control but the media were. Television and radio sets had taken reactions. The CNN newscaster was describing the tense situation in Moscow in detail and was reviewing Gorbachov's past success and failures. There were no news blackouts or KGB officials to take retaliatory action.

No army, no politicians, no bureaucrats were there to hamper the information flow. TV, newspapers and radio were the focal point where one got the output and punched in the inputs. None of the foreign news services like the BBC World Service, Radio Liberty and Voice of America had been jammed. To cap it all, the coup leaders announced a press conference. Never before had power grabbers in the Soviet Union felt the need to justify their actions to the media.

On August 19, 1991, TASS announced that Yanayev, the Soviet Vice President, had replaced Gorbachov for health reasons. A six-month state of emergency was imposed and a special committee was set up to govern the country. The Committee included Defence Minister Yazov, KGB Chairman Kryuchkov, Premier Pavlov, Interior Minister Pugo and Yanayev among others. At 6.47 a.m. a column of tanks approached central Moscow and moved towards the Red Square. Two hours later, the special Committee passed a decree banning demonstrations and announced press censorship. Only nine newspapers loyal to the communist party were allowed to operate.

Meanwhile, Boris Yeltsin, the President of Russia, defiantly denounced the

coup as 'rightist, reactionary and anti- constitutional' and demanded immediate convocation of the USSR Congress of Peoples' Deputies. His speech from atop a personnel carrier was relayed by all the major international networks like CNN, ABC, BBC etc. He assured the people that the Presidents of Ukraine and Kazakhstan had promised not to cooperate with the new regime.

By 11 a.m. troops in armoured cars surrounded the offices of TASS and liberal newspapers like Moscow News. Some five thousand people responded to Yeltsin's plea for support and began to erect barricades around the White House (Russian Parliament). The heads of the three Baltic states denounced the coup as tanks moved in to seize key installations in their republics.

On August 20, the size of the crowd defending the White House swelled to 50,000 and fifty percent of miners in the country stopped work. By six in the evening, Ukraine and Kazakhstan officially joined Russia in condemning the coup. Yeltsin meanwhile appealed to Russians for support in a TV broadcast from inside the Parliament that was barricaded. Soviet TV announced that Premier Pavlov had been taken ill with high blood pressure. At 9.10 p.m. the Estonian Parliament declared its independence from the Soviet Union.

I desperately tried to call my Russian friends in Moscow. Finally, to my amazement, I got through to my stockbroker friend Alexei. He said that he and his friends were on their way to protect the White House from Soviet troops. "Tonight is critical. If we manage to prevent a military takeover of Parliament, we will have won," said Alexei.

On August 21, in the early hours, Soviet paratroopers took over Lithuanian and Estonian TV stations and closed an independent Moscow radio station opposed to the coup. Three youths were killed by troops while they stood an all-night vigil near the Russian Parliament. At 11.15 a.m. Yeltsin told Parliament that the ringleaders were fleeing the capital. At 1320 GMT, the Soviet Ministry of Defence ordered all troops to withdraw from the capital. The whole world watched with relief as a visibly shaken Gorbachov, accompanied by wife Raisa alighted from his aeroplane in Moscow.

The coup collapsed in two and a half days, because the ringleaders could not control information technology. Satellite television and telephonic conversations between top leaders successfully portrayed the ineffectiveness of the coup. The plotters could not control the media and therein lay their failure. American TV and radio networks openly conducted interviews with Yeltsin's embattled supporters and beamed the pictures directly from Parliament building. In the process, they showed the outside world the determination of the supporters of democracy. This helped President Bush, Prime Minister John Major and many others to denounce the coup with far greater conviction.

But the question is could the coup leaders have succeeded in controlling the information systems? Events during August 19 and 20 suggest the answer in the negative. In their struggle with the microchip, the conservative junta struck at independent and underground news agencies on Tuesday night by sending jolts of high voltages across the nation's power lines. The electricity fried their

equipment, according to one Leningrad journalist.

The journalists, however, were defiant. The Union of Soviet Journalists faxed a strong anti-coup appeal to its members asking them to "report only the truth" Journalists came by the dozen to help set up transmitters in the White House. Ekho Moskva radio, Yeltsin's mouthpiece, was manned by professionals who had defected from the state-run TV and radio. Printers and journalists at the government newspaper, *Izvestiya,* went on strike after the editorial board refused to publish Yeltsin's appeal. The conservative editor of the paper finally had to give way and *Izvestiya* hit the newsstands the next day complete with Yeltsin's call for a general strike. In Moscow metro stations, a poster war was launched against the coup by the banned *Moscow News.*

Yeltsin meanwhile could set up a telephone hotline with Bush and Major. He informed them above the situation in the country and Bush in turn warned Yanayev and others against taking military action. In Leningrad, the radical Mayor Anatoly Sobchak took control of the city, allowed banned newspapers like *Smena* and *Nevsko Vremya* to publish full statements of Yeltsin and himself. Also Leningrad's TV and an independent radio station were still on the air and were received by Moscow. The state Committee's failure to control information technology was obvious from the fact that even official Soviet TV broadcasts highlighted Bush's criticism and local government support for Yeltsin.

The hopelessness of the powergrabbers' attempt to control the microchip was manifest in their inability to clamp down on foreign journalists. CNN was using a Soviet satelite to telecast scenes of revolt outside the Russian, Parliament. The interim government even admitted Western journalists such as ABC's Ted Koppell who entered Moscow to host Nightline.

"I think there is an underground system in placed and the information flow will continue even if the government shuts it down," said Eason Jordon, the foreign editor of CNN. How did this underground system form itself under the very nose of the coup leaders? The answer lies in the process of Glasnost initiated by Gorbachov as an integral part of Perestroika in 1986.

Perestroika meant restructuring in all spheres including technology. Gorbachov realised that the country was falling behind in the technological race. Computers, fax machines, satellite television were becoming the new passwords to the nineties. Glasnost (openness) was aimed at releasing the hidden potential for action in the Soviet people. It used technology to engage masses in lively debates and gave them a personal stake in the ongoing revolution. On Soviet television, one often began to hear heated discussions on religion, privatization, anti-Semitism—topics which had been taboo. The explosion of information technology was manifest in the everyday life of the people. Soviet citizens were allowed to see programmes from the 'evil' capitalist people. Moscow got a new satellite TV channel, the Super channel, which telecast Western programmes similar to Star TV. Rock shows, informal chat shows on every imaginable topic and Western life-styles were shown. When I was in Moscow in June 1991 I saw

a Donahue show on the lifestyle of prostitutes in Nevada, USA. Such a programme would have been unthinkable in pre- Glasnost days.

By mid-1990 technology entered a superdrive. The new breed of businessmen who sprung up with economic liberalisation acquired all the trappings of their Western counterparts. Business friends proudly flashed calling cards with fax numbers. The burgeoning stock exchanges in Moscow, Kiev and Lenningrad heralded easy access to computers. In the pre-Glasnost Soviet Union, only those working in academies, and sensitive, high-tech government departments, were privy to such access. One Russian friend said that even photocopiers used to be locked up and were accessible only to authorised personnel.

The Soviet people got acclimatized to information technology with the 1989 elections to a new Soviet Parliament, the Congress of Peoples' Deputies. Candidates of all political hues learnt the art of manipulating the media. Heated debates between opposing candidates and election meetings were telecast on national television. In 1989, the government telecast live the first session of the newly constituted Congress of Peoples' Deputies, recognizing the inexorable advance of information technology. For the first time in Soviet history, the masses were able to catch a glimpse of policy making debates on the giant TV screens set up in public areas in the country. The familiarization process accelerated during the June 1991 Russian presidential elections. Yeltsin, Ryzhkov and Bakatin engaged in television debates reminiscent of the American presidential debates. Gone were the days when leaders were thrust on the people by a geriatric Politburo.

From the beginning of 1991, it became evident that Glasnost had spun out of Gorbachov's control. Scandals, involving party officials, and corruption investigations into the lifestyle of top *nomenklatura* (the establishment) were regularly reported in the media. Programmes like "600 seconds" highlighted Soviet problems. With the election of Yeltsin as the Russian President and Sobchak as the Mayor of Leningrad, Russian media became one of the freest in the world.

When news of the coup hit the world, the information technology in the Soviet Union was ready. Shortwave radio, fax machines and desktop publishers moved into action. Even as the ban on the Press was announced by the emergency committee, fax machines in foreign newspaper bureaus whirred. Independent news sources like the pro-Yeltsin Russian Information Agency, and independent radio stations were already in operation. "About 100,000 or 150,000 residents are taking part (in an anti-coup rally). The residents of Moscow are very impressed by this; the impression is that the whole of Moscow is with Yeltsin and against the Kremlin" boomed a Lithuanian radio correspondent from outside the Russian Parliament on August 20, 1991. Meanwhile, Estonian radio was advising listeners how to phone abroad even if an international telephone exchange were taken over. More high-tech gadgets were also available to the embattled Soviet citizens. In a surprising number of homes there were small satellite dishes to watch international media like CNN.

Five years of Glasnost gave people the courage to come out on the streets to

protest against injustice. Familiarity with informatics gave them the winning edge. The conservative junta could do little against such overwhelming odds.

Today, the Union of Soviet Socialist Republics is no more. In its place we have a confederation of republics who espouse the ideology of capitalism. Perestroika and Glasnost made these changes possible. In a country where even three years ago photocopiers were locked up, the boom in informatics made it easier for the people to resist the coup and tougher for the power grabbers to win.

Today, technology is an integral part of life, with home appliances, bathroom fixtures, packaged foods, air-conditioners, automobiles, radio, television, calculators, electronic watches, telephones, personal computers, new equipment and many facilities readily available all over the world. Today, human developments in a society are measured in terms of technological developments. The advanced societies are technologically advanced and societies without technology are still poor and developing. Everyone now recognizes that the race for development is the race for problem solving and technology.

Since most of these modern technologies, products and services were developed in the Western world, the socialist and developing nations have been left behind in receiving benefits and the resultant prosperity.

The recent explosion of freedom in the East European nations and the Soviet Union has roots in technology, because their leadership and people at large desperately want systems similar to the one prevailing in the Western nations for democratic norms, competitiveness, free markets, openness and entrepreneurship necessary for harnessing powerful and pervasive technologies of today and tomorrow. They want to improve the standard of living of their people and be part of a process of globalization with freedom to express, act and associate with others as equals.

Eastern Europe

Eastern Europe, where until recently communist regimes prevailed, comprises seven states with a population of around 140 million. These are: Bulgaria (population 9 million), Czechoslovakia (16 million), East Germany (17 million), Hungary (11 million), Poland (38 million), Romania (23 million) and Yugoslavia (24 million). In all these nations, major events took place in the last quarter of 1989 and the first quarter of 1990 to fuel democratic reforms. In Bulgaria, protest rallies started in December to demand new elections. In the January elections the Communist Party lost and well known reformer Andrei Lukanov took charge as Premier with a promise to liberalize the economy, bring in foreign investments, create new jobs and build democratic institutions. In Czechoslovakia, during November 1989, over a quarter million people demonstrated for free

elections. This led to the resignations of the establishment members and elections were announced shortly thereafter which allowed playwright Vaclav and deposed leader Dubcek to play an active role in the new government. Czechoslovakia is one of the richer nations of Eastern Europe with great potential. Leaders there are also pushing for democracy and free market economy.

Richest of all the seven nations was East Germany with gross national product of around $150 billion, and an average income of about $9,500 per person. The Berlin Wall first opened in November which gave an opportunity to thousands of enthusiastic East German youth to flee to the more prosperous West to find better job opportunities and long awaited freedom. In December, the Communist Party lost power. Thereafter, all the opposition united to challenge and subsequently rout the communist regime in the March elections. The main platform in the election was reunification of Germany and integration of the economy. Both are under way.

Hungary was the first to start political reforms and liberalization. During November 1989, in a referendum the people voted to choose a President and in December the Premier stepped down as party leader. Poland, with a larger population and also significant economic problems started market-oriented reforms early. However, its economic issues are very different because of staggering inflation—one of the highest in Eastern Europe. In Romania, Ceausescu, the communist dictator who led the nation for two decades, was unanimously re-elected in an election which could hardly be called fair and just. This led to massive public demonstrations with hundreds of thousands marching to show their displeasure with his authoritarian regime and secret service military. Ceausescu unleashed a bloodbath, but finally lost the game and was executed publicly. In January 1990, the Communist Party was outlawed and the government scheduled fresh elections during April.

Yugoslavia, with common borders with many countries and a large ethnic population with diverse cultures and customs, has been trying hard to unite opinion and move forward with economic liberalization. There, in December 1990, the Communist Party relinquished monopoly of power and by January 1990 allowed a new multi-party system to emerge.

The revolution in Eastern Europe was the great event of 1989. The whirlwind of change swept away not only leaders but also institutions that held the people in thrall for 45 years. The political map of Europe, drawn up at the Yalta Conference after World War II, is being redrawn. The whole of Eastern Europe has broken out of the Soviet plaster cast that cramped its movement for 40 years and emerged to take charge of its own affairs.

The revolt in Eastern Europe was spearheaded by the forces that are reshaping the world. These are, modern media and technology, mounting aspirations, consciousness of human rights and the ideals of pluralistic democracy, and a regionwide triumph for Western liberalism unknown even during Eastern Europe's brief, unstable freedom from foreign domination before World War II. The old order is now being replaced by the resonance of democratic aspirations

in which the demand for a multi-party system, coupled with the rule of law has become the order of the day. The Communist parties in Eastern Europe have begun to transform themselves into social democratic ones on the pattern of West European parties.

The protagonist of Eastern European revolutionary transformation was Gorbachov. It was the result of his struggle to modernize the Soviet Union's own unworkable system of Government and pattern of alliance. In 1989, Gorbachov withdrew the threat of Soviet force from Eastern European politics for the first time since 1945. With that, the communist regimes set up by Stalin had neither the material nor the political means to resist the demands of their own people. The Soviet Union earlier controlled these states through a mixture of brute force, local party satraps and great-power politics. The radical changes in the contours of socialist democracy signify that the Stalin-Mao mould of command socialism is dead.

The revolutions in Eastern Europe might have succeeded much earlier in bringing about fundamental and profound changes. The process was halted by the Soviet Union by direct or indirect interventions. Such interventions were evolved into the Brezhnev Doctrine under which Warsaw Pact forces snuffed out the Prague Spring of 1968. The process of change challenged not only Soviet ideological supremacy, but also the Communist Party's self-proclaimed monopoly of political power and control in the entire bloc. The Stalinist methods of governance were rapidly denounced by the Eastern European nations. They were encouraged by Gorbachov's 'openness' and 'Perestroika'.

The nations of Eastern Europe are remarkably different from the other European nations. Their cities are dull and dying and belong to the era before World War II. Pollution is rampant and smoking chimneys proclaim the old concept of industrialization. The houses do not seem affluent and offices always remind one of socialist bureaucracy. The cars are small, noisy and antediluvian. The shops are empty and consumer products scarce. Fashion is absent. The countryside is worse. The infrastructure for transport, energy and communication is poor. The telephone systems are as bad as in some developing countries. Most of the equipment is old. It would be no exaggeration to say that half of the East Europeans are waiting for telephones and the other half for the dial tone.

Everything in Eastern Europe needs to be modernized—from consumer products on the shelves in the departmental stores to automobiles. To bring Eastern Europe on par with some of the other well-to-do European nations will require over five trillion dollars to modernize infrastructure, industries and institutions over the next couple of decades.

Gorbachov's policy of liberalization, however, also let loose a process of unravelling of the Soviet Union itself. The suppressed ethnocentric nationalism started emerging in many constituent Republics of the Soviet Union. The Baltic Republics of Lithuania, Latvia and Estonia began questioning the validity of their accession to the Soviet Union. The separatist popular fronts in Estonia, Latvia and Sajudis in Lithuania proposed a series of reforms intended to miti-

gate their incorporation into the Union. Though initial moves were taken by Estonia, the smallest of all the Republics, it was Lithuania that took the lead subsequently and declared its independence in the newly elected Parliament in the capital Vilinus.

The changes in socialist nations signify the limitations of command type Socialism. The modern scientific technological revolution threatened its viability and its deeply entrenched power structure. The expectations of the people were rising high. The old orthodox regimes were unable to fulfil them. Extra economic efforts and political democracy can enable these nations to come to terms with the new forces emerging at the world level. The reunification of Germany would lead to geographical changes in Europe. With the advance of modern science and communication systems, the world is becoming more and more interdependent. The division of the world into blocs is impossible now. The new alignments and realignments are the logical outcome for integrated development at least in Eastern Europe.

Eastern Europe will continue to remain in a state of flux for some time to come. New found freedom demands discipline to develop democratic, decentralized systems. Free market economy requires different distribution systems, new work methods, innovative incentive schemes and a lot of investments. Everything will continue to take much longer than expected. It will continue to be difficult and expensive to integrate various elements. In the process some people will be isolated and confusion and chaos will continue to prevail. New forces will emerge with conflicting demands. It may take almost a decade to reach the comfort zone in Eastern Europe.

Other Initiatives

Brazil : After two decades of military dictatorship, the election of 1985 in Brazil marked a transition to democracy. For the first time the foundations of a pluralistic and democratic culture were laid down. The peaceful and orderly transition to democracy was the result of the people's long struggle for the return of full democracy: a free press, direct elections and the strengthening of National Congress. Jose Sarney's accession to presidency coincided with the simultaneous explosion of an economic and social crisis which was a legacy of both the recent past and the nation's history. The Sarney administration faces substantial economic challenges: an annual inflation rate of over 250 per cent, a foreign debt of more than $115 billion and an unemployment rate of over 20 per cent. On February 28, 1986, the government announced a far-reaching programme of economic stabilization known as Cruzado Plan. The plan was calculated to control consumption and provide for continued growth with the goal of eliminating misery by the year 2000.

The beginning of the 1980s marked the end of a unique cycle of economic growth that lasted approximately a decade and a half. Inflation has been an age-

old problem in Brazil that worsened in the post-war period. The second oil shock, the explosion in international interest rates in 1978- 80, the world recession over the three-year period 1980-82, and the sudden contraction in international credit markets beginning in the third quarter of 1982, all led Brazil to the brink of an exchange collapse in the last four months of 1982. Economic reforms therefore received popular support and the majority approved the programme.

The stabilization programme has introduced profound modifications in the functioning of the economy. As Brazil's former Minister of State for Planning Joao Sayad writes: 'The fundamental guideline of the entire programme is a commitment to sustained economic growth and social justice. Potentially, it is a commitment to democracy. What we are dealing with here is, therefore, a programme that rejects the idea that inflation must be combated through recession. It rejects recession while opting for growth. It is also ethically opposed, for it rejects unemployment and protects the income of workers. It is opposed on the basis of economic theory because it recognizes that the process of inflation feeding upon itself and creating even higher inflation is at the core of Brazilian problem.'

Under the new plan, the change in currency with fixed parity in relation to the US dollar was a symbol of the complete transformation of economic life in Brazilian society. The reform package guaranteed the control of the primary sources of inflation. The reduction in public deficit, dropping of interest rates, the stability in farm price and balancing the external accounts were the chief measures. The creation of unemployment compensation and an automatic wage scale were aimed at balancing and protecting the nation's workers in the low income brackets.

The Cruzado Plan also included a number of measures aimed at promoting savings including a new tax-free retirement fund and fiscal amnesty intended to recapture some of the money floating in the parallel economy. As a further step along the road of deindexation, treasury bills were freed of inflation indexing and started to float with interest rates. The new measures had a projected revenue of $11.3 billion, nearly 4 per cent of GNP. According to Finance Minister Dilson Funaro, the Government's share of the adjustment in the form of cuts and privatization would account for slightly more than 20 per cent of the new revenue.

The Cruzado Plan has been enthusiastically received by the people. It is bringing return to growth. The plan has engineered an unprecedented consumption explosion. Increase in wages and bonus and the price freeze resulted in the largest buying power gain in decades. Ultimate success of the plan, however, depends upon the Government's ability to face other challenges.

China: The post-Mao leadership initiated changes in economic policy and political leadership in 1977-78. These changes meant neutralizing large parts of the Maoist interpretation of the Marxist-Leninist ideology. At the third plenary

session of the Eleventh Communist Party Central Committee (December 18-22, 1978), Deng Xiaoping undisputedly rose to the top ranks at the start of a new era: the era of reforms. The reforms were primarily aimed at changing the economy. Their pragmatic objective was to increase the quantity and enhance the quality of production via new economic structures and rapid technological modernizations with the help of know-how and success of Western capitalism. Ideology or no ideology, planned economy is synonymous with stagnation. Chinese leadership realized that the only chance for progress was to incorporate elements of market economy and principles of economic production. Deng Xiaoping initiated a series of agricultural, industrial, commercial, financial and other reforms that gave greater scope to market forces (known as four modernizations) and began to lessen the role of the state in the economy, although the scheme of reforms intended to retain planned economy as a superstructure.

Chinese economic management system was copied from the Soviet Union in the early 1950s. It is characterized by a high degree of centralization and unification, regulation by planning alone, and heavy dependence on administrative means of control. This system played a positive role in the early post-liberation period when China concentrated its efforts on building key projects, but it lacks flexibility in dealing with the ever-changing economic activities of enterprises and fails to respond to complicated situations. China's long-standing economic imbalances, distortion between production and demand, poor economic results and tremendous wastes are directly related to this irrational economic management system. Chinese socialism can evolve if the planned economy and market economy systems are closely interlinked. Such a programme of reforms should be complemented by an opening to the outside world.

Economic restructuring began much earlier in Beijing than in Moscow. The People's Republic not only began at an extremely low level of development but Mao Zedong could not expect assistance from the West and then also lost the support from the Soviet side. He twice plunged his nation's economy into chaos, via the Great Leap Forward of 1958 and the Cultural Revolution after 1966. Following Mao's death, there was chaos again on account of the fight for supremacy between the Gang of Four and Hua Guofeng. Beijing now condemns two complete decades as periods of 'leftist errors'.

Under Deng's direction, the Chinese Communist Party set a new economic course. The third plenary session of the Eleventh CPC Central Committee in December 1978 decided to shift the focus of the party's work to socialist modernization. The reforms began with changes in the farming sectors, the dissolution of the People's Communes and market deregulation. Deng's key motto is the separation of party and production, party and management and party and state mainly because unqualified party officials were crippling production and preventing progress. All means of production, however, are to remain the property of the people and are the property of the state. The first target of the reforms was to raise the living standards of 800 million peasants which had

stagnated for two decades. Rural reforms included increased financial incentives to peasants, decentralization of planning and, most important, changes in agricultural organizations.

In the industrial sector, readjustments were made to decentralize administrative controls. Experiments were conducted to expand the decision making levels of state-owned enterprises. This was a decisive break from the Soviet model of a command economy controlled by a central bureaucracy. To assist the process of socialist modernization, the CPC, on October 20, 1984, in its reform of the economic structure document, called for full enterprise autonomy, incentives to increase labour productivity, less planning, a rational pricing system, reform of the tax, financial and banking system, competition, consumer sovereignty in the market-place, the rule of law, the trimming of bureaucracy, wage differentials to reflect differences in skill, outright acceptance of unequal distribution of income, expansion of the place of individual economy, contracting out the work of state-owned enterprises to individuals and small-scale collections, the opening of China to foreign investment and the replacement of old party comrades by younger professionals.

Several other commercial, investment and trade reforms were also undertaken. The search for foreign capital included international borrowing and a concerted effort to attract direct foreign investment to China, especially advanced technologies. China's opening to foreign investment was a radical departure from the past practices. Autonomous special economic zones were created in some provinces to attract foreign-owned enterprises and joint ventures to produce goods for export. The government's intervention was minimized.

Though the scheme of economic reforms was coherent, its implementation was delayed because of the conflict between conservatives and liberal reformers. The unsystematic and half-hearted implementation resulted in incoherent development. The leadership's failure to deliver political reforms weakened the public support for the reform policy causing more and more segments of the people to give vent to their disappointment. Political authoritarianism aimed at preserving the leading role of the Communist Party always clashed with the policy of economic liberalization. Democratization in Deng's political reform was to be introduced from the top down and not the other way round. In any case, political reform is only permitted within the bounds of the four basic principles that govern the entire reform process laid down by Deng Xiaoping in 1978. These are, adherence to Socialism, Marxism-Leninism and the teaching of Mao Zedong, to the democratic dictatorship of the people, and, most important, the party's monopoly on power. Even though some of the nation's liberal reformers probably knew that increased economic independence would one day lead to pressures for political participation beyond the boundaries that had been set, they still saw room for more coordination before the flood level would be reached.

Economic activities do not take place in a vacuum. Economic growth is in-

fluenced by various factors like culture, politics, the introduction of new technology and physical and human capital as well as interactions among these factors. The communist totalitarian regime in China, however, maintained an iron grip. The neglect of political reforms led to student protests in 1985. Inflation surged at 11 per cent in 1984. Living standards were going down in urban areas. The students' movements protested against nepotism and corruption in party and bureaucracy. But they were labelled counter-revolutionaries and crushed by the brutal massacre at Tiananmen Square in Beijing in June 1989. The use of force or terror is no longer a viable solution for Chinese socialism to evolve further. Political reforms, freedom and democracy can be the instruments for the success of economic reforms. What the people in China seek is a democratic solution that combines in itself social justice with relative prosperity, the sense of common purpose with the opportunity to use individual talent, and authority with participation.

India: The government that came to power in 1984 announced a 'new model' of socio-economic policies and planning. The hallmark of the new economic policy was its emphasis on liberalization and competition. Drastic changes were made in fiscal policy, industrial policy including licensing, import and export and labour policies. Though the trend towards increasing liberalization started in the early 1970s, the new policy marked a distinct break with the past. All economic measures added up to a new path of liberalization as advocated by agencies like the World Bank and International Monetary Fund.

The new economic policy was characterized by tax concessions for the large corporate sector, especially monopoly houses. This included delicensing of 25 industries and the raising of the asset limit for Monopoly and Restrictive Trade Practices (MRTP) Act coverage to Rs.100 crores from Rs.20 crores. Imports were further liberalized, including reduction of customs duties on capital equipment imports and concessions offered to foreign capital. The regulation and control of the private sector were made more liberal. Regulation through Plan policies was replaced by market and competition both local and foreign. Companies were allowed greater freedom in investment, and use of foreign brand names by Indian companies were liberalized. The new economic policy provided more opportunities for the expansion of the private sector, especially the corporate segment of manufacturing industries. All sectors were opened for the free entry of private enterprises that included many public utilities like roads, highways, post, civil aviation, telecommunication and gas based fertilizer services. The process of privatization got an impetus because of fewer controls, and a large number of incentives in various fields like fiscal credits, capital issues, import collaborations and location. The rates of return available on private investment have also gone up as a result of lower rates of direct and indirect taxes, removal of price control and distribution of controls, cheap and subsidized inputs, liberal import of technology, capital goods, raw materials and components.

In order to continue the movement towards import liberalization, a three-year import export policy 1985-88 and 1988-89 was announced. The new policy decanalized the import of 53 items and 201 machinery items were brought under Open General Licence (OGL). The economy was opened to greater international competition. For attracting more foreign investment, a number of concessions were also announced. As a result, the number of approved foreign collaborations increased from 526 in 1989 to 740 in 1986. A significant number of these were in the public sector.

Maintaining the same tempo of liberal policy, the government welcomed the entry of multinationals operating in India into the electronic industry. The government's electronic policy envisaged both massive influence of foreign technology and a considerable expansion in computerization of the domestic economy. The Department of Electronics identified 15 new major areas for large scale computerization. The output of the electronics industry was slated to increase fivefold during the Seventh Five-Year Plan period from Rs.20 billion in 1985 to Rs.100 billion in 1990. The new policy clearly stated that import of technology would be permitted 'freely'.

There are obvious elements of continuity between the new economic policy and earlier policies. Essentially, both sets of policies were aimed at promoting economic growth through reliance on private capital, both domestic and foreign with the public sector playing a supportive role. The new economic policy as a pro-private sector marked a clear and major break with the past. Since independence, India has been following the path of import substituting industrialization with stringent qualitative restrictions on international trade and domestic production. The gradual shift towards more liberalized outward looking economy has not been without detractors. The gist of their criticism has been that a strategy of growth based on 'luxury' consumption and 'export promotion' would be disastrous. It would give rise to greater unemployment and create severe balance of payments problems which would eventually land the nation in a debt trap.

The advocates of liberalization and privatization, on the other hand, argue that it would restore incentives which in turn would promote productive efficiency and bring about a few more advantages. They highlight several success stories like South Korea, Taiwan, Hong Kong and Singapore. India's policy announcements point to the direction of the South Korean experience. After 1960, South Korea switched over to a policy of export promoting industrialization through liberalized imports of machinery and technology, substitution of quantitative restrictions by price measures, reducing the average rate of protection, continuous adjustment in the exchange rate and providing a conducive climate for export promotion. South Korea since 1960 has achieved not only a spectacular rate of growth of GDP and per capita real income through export-led growth strategy but 'equality' of growth in terms of reducing inequality in income distribution, growth in real wage and employment, life expectancy, etc.

In the final analysis, for India, import liberalization would lead to a large bal-

ance of trade deficit in the short run. But in the long run, its subsistence depends on adequate handling of the strains on balance of payments without recourse to large scale foreign borrowing. Its success also rests on the export earnings of the manufacturing sector.

Indian economic reforms got a real fillip in 1992 with the delicensing of industries, encouragement of foreign investments and privatization of public sector undertakings. Competition was introduced in monopoly industries such as airlines, petrochemicals, coal, etc. Partial convertibility of the Rupee and many more initiatives heralded new reforms. For these reforms to succeed major reforms are required in administrative machinery and labour laws. Without enthusiasm, energy and support from the labour and the administration it is impossible to implement reforms at the working level. All those who continue to benefit from the old system of controls will continue to resist and slow down reforms. New stake holders must emerge who, in the long run, will benefit from the new initiatives. They must be visible as a viable force to fight the old system of controls. To communicate and coordinate these reforms is a monumental task and requires special professional skills to mobilize public opinion.

6. New Awakening: New Alliances

After 40 years of Cold War, history has taken a new turn. After collecting warheads for four decades, the world is now ready to destroy them all to move towards peace. Perhaps, this is the end point in the history of mankind, where confrontation is being replaced by cooperation. Perhaps, civilization is at last maturing to a point, where it is willing to initiate actions for some kind of world government and universalization of Western liberal democracies all over the globe. Possibly, this will emerge as the final form of global government everywhere. Or, maybe the East-West tension is being replaced by North- South tension.

The world is awakening from a bipolar Cold War stance to a multipolar one and an open and more peaceful future where political ideology and security are taking a back seat while technology, markets and economy are getting greater attention. Everywhere, the role of the big Government is being minimized and private initiatives and public participants are being encouraged to take a hand in managing matters. Ultimately, this may globalize trade, technology, ecology and democracy.

The world is awakening also to the fact that the gap between the socialist and the capitalist countries is widening. In the socialist nations, standards of living are falling, there are shortages of products and services, growth rates declining, the economy stagnating. There are far too many internal controls. People are dis-illusioned with socialism and enamoured of capitalism. The exposure to the Western lifestyle, consumer markets, flexibility, etc., has forced an explosion of freedom and call for democracy in Eastern Europe with a desire to reorient, realign and create a new world order. The new awakening is bringing new freedom to millions in the socialist nations and is leading to the formation of new alliances with the other nations of the West.

New Awakening

A few reasons could be cited for this explosion of freedom, new awakening and new alliances. First, the continuing growth and prosperity in the US and some European nations have reached a saturation point, and further expansion at the same pace is not feasible. Their population is decreasing and ageing. Their infrastructure for transport, communications, energy, utilities, and education, is all in place, and needs only minor maintenance and slight modifications. In the US,

for most of those who are willing to put in a hard day's work, good housing, education and entertainment are all assured. They have moved from three bedroom houses to four bedroom ones, from one car a family to two cars, and from one telephone to three. Where else they have to go now? Traditional markets are saturated. They now must look for larger markets, outside, to keep their factories humming.

In the global markets, they have had limited success in the Asia Pacific nations and in South America. The Asia Pacific nations came as competitors and the South American nations could not pay their piled up debts. The other two potential large markets, India and China, plus some African nations turned out to be difficult to penetrate. The cultural barriers and the memories of colonial exploitation inhibited their receptivity to technology and products. At every point there were either bureaucratic hurdles or problems associated with application, acceptance, utility and adaptability. In these nations, there is a lack of appreciation of what technology can do and cannot do, where to use and where not to use, how to use and how much to use. Because of the built-in biases and resistance to technology and modernization, the potential markets have not paid due dividends on time. In some of these nations, there are significant barriers to entry coupled with long periods of gestation.

All along, while focusing their attention on developing these markets, Western nations hardly paid attention to the potential markets in the socialist nations, mainly because of ideological barriers. The two systems were considered so different, that sharing of markets was unthinkable. For Western companies, the socialist markets were off bounds. Mikhail Gorbachov with his Perestroika and Glasnost changed all that. Now, suddenly, it was acceptable in the Soviet Union to talk about the poor quality of the local goods and the desire to acquire foreign products and services. This seemingly simple political initiative fired the imagination of the other socialist nations which took up their call for freedom and desired to liberalize their economies. The process of freedom was expedited surprisingly fast.

At present, the US and other Western nations see this formerly socialist nations as a major untapped market wide open. Western entrepreneurs find them more ready for technology and products than developing nations, which they have been exploring for decades. The cultural similarities between them give a head-start in developing new markets, which are ripe and ready. The common market for the white customer is easier to mobilize, than the traditional mosaic market with many developing nations. East Europe is near geographically, shares common borders and is easily accessible. Why look thousands of miles away at the other parts of the globe when products can be easily sold next door? Western capitalists are now prepared to give all the help these newly democratic nations need to expedite their process of economic liberalization. They are prepared to provide management, money, manpower, and manufacturing know-how to develop new markets. This is true, though it sounds too simple to believe and too far-fetched to accept.

Capitalism has proved to be a remarkably stable system. It has also had the inner strength to accommodate socialism by creating institutions to subsidize education, health services, employment benefits, and social security. But socialism could not accommodate capitalist concepts related to free markets, open economy and efficient distribution of goods and services. The path from capitalism to socialism has worked, but no one has yet tried to tread in the other direction.

In the USSR, socialism worked well in arms production and in meeting the basic minimum needs, but failed miserably in meeting people's need for consumer goods and services. A healthy market needs feedback to modify market strategies. A centralized command and control system, like that in the Soviet Union, on the other, could not diversify and create an appropriate and open communication system to listen to the messages from the ground, relating to people's aspirations. In a centrally planned economy only the upper middle class, the educated; and the elite dictate planning for products and services for the masses based on production quotas and elaborate rules and regulations. Obviously, Marx and Lenin failed to recognize that some day technology and markets would have to take over to meet people's growing aspirations for more goods and services, in order to increase human comforts.

To understand new trends in entrepreneurship, the Soviet Union under Gorbachov started organizing international conferences on entrepreneurial development and the world economy. A conference on these lines, held in the Moscow State University with a special session at the Moscow School of Management and the USSR Union of Engineering Society, dealt with the role of entrepreneurship in economy and social development with particular emphasis on cultural and institutional setting, necessary for entrepreneurship to thrive. From this kind of interactions it became clear that challenges required to convert a centralized economy into a modern market based system are enormous.

Recent developments in Eastern Europe are seen as a big opportunity for Americans and the US economy in the years ahead. American farmers will start to gain immediately. The former Soviet Union and the East European nations are great places for the export of American grains and other food products once the restrictions on exporting to these nations are lifted and other problems resolved. There will be enormous opportunities for the US business community as well. Since there are no experienced bankers, accountants, lawyers, salesmen, advertising promotion experts, marketing managers, sales representatives, distributors, innovators, entrepreneurs, etc. the East Europeans need support in these areas. However, at this initial stage it is difficult to do business in this part of the world. Western manufacturers of the larger variety have not yet entered this market in a big way. Further legislation will be needed, with more incentives and flexibility to attract them. To them non-convertibility of the local money and the problems of obtaining foreign exchange are the main bottlenecks. There is also this ambiguity of existing tax legislation which creates confusion. There are also issues related to bankruptcy and associated repatriation

of profits. The lack of capital market is also a problem in attracting foreign investments.

Towards creating new alignments in Europe, there is also awakening and craving for a united Europe, to bring back the glory of the past. Europe has been divided physically, mentally and emotionally for the last 40 years. The Europe of the West is the land of democracy and free economy, while the Europe of the East was, till recently, totalitarian, secretive, and had a centrally planned economy and resulting shortages. The terror of the secret police service had infiltrated into almost every part of the socialist system. It had created an environment of insecurity and fear all round. There was no freedom of speech and human rights were frequently violated. The slogans of human rights and television signals having brought openness to the forefront, Europe once again has a chance to be united, this time without war, and through the consensus of the people. With an impetus from the European Community of 12 nations to be united as one economic entity by 1992, the opportunity to join the eastern pact is attractive to many. The new awakening in Eastern Europe is pushing for this new realignment of the East and the West. Besides bringing their people together, the union will bring their economies together and merge the markets for mutual prosperity.

Globalization

Today, globalization is a catchword for all business strategies. All major multinationals are becoming global, constantly looking for acquisition, joint ventures, investments and marketing arrangements. In the long run, no business unit can hope to be a front runner without a sound strategy for globalization.

Globalization has been gaining impetus with the realization that the complexity of running a modern economy in the fast-changing world is incompatible with centralized planning and the system of total state control. The socialist nations also realize the need to choose market economy and abandon Marxism. They would be justified in this changeover even theoretically, because the Communist Manifesto insists that capital is a collective product and it is converted into a common property by the united action of many members of society. Through private and public ownership, it is now possible to have the freedom and flexibility to manage and motivate labour and benefit from the competitive markets the world over. Global business requires adaptability and flexibility to move quickly without bureaucratic barricades to tie up global deals.

Globalization may be at the level of (a) finance, (b) trade, (c) industry, and (d) technology. These are interconnected levels with well defined interfaces and interactions between them.

Globalization of finance implies the ability to invest freely in any part of the world for local or export markets and to convert earnings in the appropriate desired currency. It also implies freedom in funding of large national programmes by international agencies to encourage development and sale of pro-

ducts and services. At present this is difficult, because there are various major currencies in the world with varying degrees of strength and weakness. Though there are some hard currencies like the dollar, yen, pound, etc., most other world currencies are difficult to convert. If the EEC plan to develop one common currency succeeds, the relationship of the dollar with the yen will automatically force an international system in the next few decades, with a standard world currency in the form of, if not one, at least two or three instruments.

This globalization will be reflected in the national debt and the ability to borrow. Nations with sound financial systems and better balance sheets will get a bigger share of the investments while debt- ridden nations will have a difficult time in borrowing and attracting investments. In every nation, economic policy is now being tied to internationalization and deregulated financial markets. Economic advisers are keenly concerned about international exchange rates, interest charges, debt burden, investment patterns, and the implications of these and other financial parameters within and outside the national boundaries.

In the last 50 years, when globalization was not very prominent, the pot of gold shifted from place to place in phases spread over decades. First it was with the US which, with a lot of industrial muscle, built the highest standard of living with four-bedroom houses, two cars and two telephones per family. The oil crisis of the 1970s moved this pot of gold slowly but surely from the US to the Gulf countries. And they went on a spending spree. Quickly, the Americans learned to save oil and energy. Energy prices, consequently, stabilized and demand decreased drastically. In the next decade, the same pot of gold shifted to Japan. Japan's quality products captured all the major markets in Europe and America and gold started piling up in Japan. The yen became very valuable while the US debt increased to its highest. But the US still kept the dollar, through proper intervention, at a reasonable level.

The scenario will change much faster in the decades to come because globalization of economy will move this pot of gold from place to place much faster. The ultimate objective of economic globalization is to make every currency convertible at real market value in the international market.

The next level in globalization is trade. In the last five years, world trade has grown more strongly than industrial output. In 1989, world trade in goods increased by 7 per cent, more than double over the previous year. The trends in global trade will depend on the rules of the game which are being dictated by the advanced nations of the West. The world is now used to buying products across the globe, if they are cheaper and better than in the domestic market. This trend will continue because of increasing competition the world over.

Globalization in industry, which is the third level of globalization, reflects a change in the international pattern of production. Most industrial production now is tied to international alliances, to secure components and raw materials from the world market. With this globalization, a product may now be sold in America which is produced in Europe with components from the Far East and marketing skills from somewhere else. It is usual for leading multinationals to

have many tangible international links, joint ventures and marketing and licensing arrangements for production of major items like, cars, engines, software, communication equipment, computers, etc. In the process, many regional groupings are being formed. The US and Canada have formed a market on their own without any barriers or boundaries; the EEC also intends to create a regional grouping; the Asia Pacific nations with Japan as their leader, are emerging as another dynamic alliance for trade and industry. Now, the multinationals have to be alert with a great deal of management skills to coordinate globalization at various levels. They have to be constantly alert for new trade and investment opportunities anywhere in the world.

Another level of globalization is technology. Today, most technology is available exclusively in the Western nations while the growing markets are in the Eastern and developing nations. However, developing nations offer a lot of human potential for new technology. The population in the Western nations is decreasing and ageing while that in developing nations is increasing and young. If skilled labour is cheaper in developing nations, multinationals will go there; they also hope ultimately to develop trade there. Software is an example. Software costs are increasing rapidly in the Western world and software manpower is difficult to find. Potential software talent is available in large numbers in countries like India and China. Multinationals are now setting up capabilities in these nations to develop less expensive software.

In the next decade, the emphasis will shift away from how products are produced to what sort of products are produced, the location of the market and the technologies needed to make these products. More emphasis is being placed on maximizing value added in the product with more local knowledge content. To meet the increased R&D expenses, market share must also simultaneously increase to make the product competitive. This requires global alliances to reduce risks and increase market share. The product developmental cycle needs to be shortened, which brings pressure on time management. Just as today materials management is done by the just-in-time concept, in future, just-in-time product design will be required to be competitive and profitable in the world market. This will demand new management methods, which will call for multiple alliances that include networking and advanced communication system.

As we move towards globalization, products also are becoming more complex and demand lot more of technology. For example, the blender in the kitchen, which basically performs the same function as two pieces of stone, will have a micro-processor with liquid crystal display and programming capabilities plus bells and whistles. For this, the future utensil companies will have to learn about micro-processor, software and silicon. No single company will be knowledgeable enough in all aspects of multiple technologies incorporated in a simple product. This will create a new global market for exports in technology product designs, production techniques and various other disciplines. Manufacturers will simply specialize in assembling products based on components available from various ancillary vendors and on designs developed by the best designers in the

world. They will have to operate with a global network of designers, suppliers, and distributors.

Complex products that use knowledge-based systems will also call for a change in the social profile. Their consumers will need to be well educated and have a high standard of living. The work force also will need to have a certain minimum level of education. Globalization, which is the result of an international division of labour and resources to industrialize and develop economies, wherever feasible, for competitive products and markets, is not all roses. Though it will increase the standards of living for some, it may bring uneven developments in the world. It can also disturb national values, cultures, environment, ecology and even bring frustrations, fears and failures. Today governments deal with individual companies. As globalization increases, they will need to interact with large companies and on a different level to develop new relationships for technology and trade. Globalization, then, will lead to democratization between companies. However, to participate in this process would require powerful muscles in the beginning to get one's way through in the international markets and to form new alliances.

Positioning for the Twenty-First Century

The twenty-first century is round the corner. Mankind, in this century, will be most advantageously placed, with the unprecedented technological developments during the past 100 years in agriculture, transport, health, materials, communication, space, computers and many other areas and equally unprecedented social developments related to independence and democracy the world over. It will, at the same time, be inheriting some problems related to ecology and environment and the memories of wars and some successes like man on the moon and Perestroika.

Every nation of the world is eager to enter the next century with even better prosperity and hope for the future than now. Every nation has its own view of what it wants to be, while entering the next century. To the poor, it may mean meeting the basic human needs; to others it may mean more wealth, prosperity and more global markets. To the socialist nations, it may mean entering the new age of Perestroika, leaving behind a three-quarter century of communist ideology and revolution which keeled under global pressures. To Germans, the next century would mean once again working as united Germany. To Europe, it may mean a chance to unite the continent again as the power centre of the world.

The world today is working out alliances for the next century. The coming decade will be used for field trials and experimentation— more as a launching pad. From this decade of learning, a great deal would be finalized to plan the next century, when these new alliances will take concrete shape. In the meantime, logistics and mechanism will have to be worked out to make these arrangements operational with proper foundation by the year 2000.

The key equation in positioning alliances will relate more to technology and

markets than to ideas and theories of the past. All eyes are turned towards the three major market alliances emerging on the world scene. These alliances are spread over North America, Europe and Asia Pacific. The North American bloc, comprising of the US and Canada, is one of the largest marketing blocs with over 300 million people. It has one of the highest standards of living, an abundance of natural resources, vast land areas and a solid foundation for technology, innovation and entrepreneurship. The bloc of the European Economic Community accounts for a united Europe with 12 major nations and a population of around 300 million. It includes some of the richest nations of Europe along with the not so very rich. This group also forms a major market with considerable clout. The bloc in the Asia Pacific consists of some of the newly industrialized nations of the Far East, with Japan leading the way.

These three major trading blocs are already active in the global market, with multi-billion dollars worth of goods and services floating in every possible direction every year. They are close knit with a great deal of interdependence. They share resources for manpower, technology and manufacturing facilities. Together, these three groups contain less than 20 per cent of the world population, but probably produce over 70 per cent of the gross national product, and use a substantial part of the world's resources.

The socialist nations of Europe also form a potential market bloc for the future. But in the immediate present, they feel a need to integrate into the growing European market. They need technology, finance and management resources to modernize their systems. They want to learn from the experiences of the West and improve their living standards in the next decade. They are eager to associate and align themselves with the Western nations to move their economy forward.

The rest of the world, which constitutes a large number of developing nations from Africa, Asia, South America and the Middle East, is in danger of being marginalized and remains confused about its role in the recent realignment. The status of this part of the world in the whole equation may hold the key to the success of the realignment. Very few are, however, willing to accept this.

This is borne out by the attitudes of missions that are exchanged between nations. The majority of visiting missions relate only to trade and technology activities, directly or indirectly. When delegates of a developed nation visit developing nations, they strictly want to sell their products and services. The selling takes many forms to include bilateral agreements, long-term loans, technology access, consulting assignments, funding for R&D activities, training abroad, exchange of experts, etc. On the other hand, people from developing nations are interested only in buying. Even though they have a few things to sell they hardly make effort to sell. Most of them are interested in foreign trips, future assignments or a deal to make quick money.

The advanced nations have a well organized strategic plan for markets and alliances. They also have a communication and public awareness package to go with it. Developing nations hardly have a well thought-out long-term vision of

their commercial interests. They work project to project. When governments change, a new set of people take over, and new projects begin without any focus on strategic alliances. For a focus to develop, there should be sound institutional framework at various working levels, which is lacking in these nations. If these nations wish to find their rightful place in the world of the twenty-first century, they need to strive hard in the time left to them to position themselves amidst the emerging strategic alliances.

Since the three strategic alliances are poised to make a major impact on the world of the twenty-first century, it may be worth while considering the composition and prospects of each of them in some detail. The position of the Eastern European nations and unified Germany is also considered to lend perspective.

The US and Canada: The US and Canada, with thousands of miles of common borders, have a common Western culture and a predominantly white Christian community. They have been pioneers in demolishing trade barriers between any two big nations. For a long time, products and services have travelled freely across the border with minimum fuss. Even the movement of people across the border is free and flexible.

There are three main entry points for tourists across the border: Detroit, Niagara Falls in the east, and Vancouver in the west. At any point one can easily drive in and out with an American or a Canadian car and only a driver's licence. There are no visa restrictions, unless one is there to work. In fact, even when one enters the countryside one hardly finds any difference. The roads, houses, hotels, restaurants, offices—they all look alike in both countries. The similarities are such that one hardly notices that one has crossed the international borders, unless he is in the French speaking Quebec. There, too, English is spoken almost everywhere.

The shopping centres sell the same brands. The fast food joints display the same signs from Mcdonald's, Burger Kings, Kentucky Fried, Pizza Hut and others, familiar to both Americans and Canadians. The cars on the road are also the same. Though the currencies are different, modern plastic credit cards neutralize this difference and allow one to operate freely everywhere. The telephone calls are as simple and as quick as the domestic calls. The flights also operate like normal domestic airlines. The strategic alignment between the two nations has been in place for a while and seems to be operating well.

Differences, of course, exist, and become noticeable if one looks for them. Besides linguistic differences in the east, there are very many cultural, architectural and economic differences. However, these are minor, subdued and not distracting. The two nations are further enhancing their alliance by essentially eliminating all barriers to trade and transfer. They have essentially integrated the two nations in terms of freedom, flexibility, movement, borders, etc. while preserving their independence, identity, economy, culture and other values of concern to them.

This is the picture on the northern borders of USA. The story is altogether different on its southern border with Mexico. Mexicans are brown-skinned and their economy is developing and weak. The United States spends millions of dollars every year on its border patrol and immigration offices to control movement of people from the south to the north. All kinds of barbed-wire fences, check-posts, binoculars, helicopters, searchlights, special dogs and patrol cars with radio equipment are used to monitor these border areas. Strict immigration rules are enforced with rigorous checking for visa and passports. While travelling just across the border, one finds a sudden contrast and marked differences, not only in skin colour but also in the people's food, homes, farms, customs, language, shops, restaurants and almost everything around. The feeling is inescapable that one has arrived in a different country. The economic disparity is visible everywhere. Equally visible is the disparity in technological developments. The economic disparities between Mexico and the United States are such that long-term strategic alliances of the type between the US and Canada do not make sense. However, an alliance with Mexico to use cheaper labour across the border is very attractive to many American businesses.

The disparate strategic alliances of the United States with nations on its northern and southern borders are reflected on a larger scale the world over. The north has developed while the south is developing. The north is secure, prosperous, wealthy and knows how to use technology for development. The south has a lot to learn on this front. Incidentally, it needs to be noted that the new awakening in Eastern Europe is for alliances of the northern type.

EEC—The European Community: About the same time when Gorbachov was ready to take charge of the Soviet system, in 1985, the European Community of 12 nations decided to organize internal markets for free trade of commodities, products, technologies and free movement of people. The target was to implement this programme by December 31, 1992. The objective was to provide a single market for a population of 330 million, to the same degree as the US with its total population of 240 million. This will, no doubt, be the largest market with formidable competitors on the international scene.

The programme was the brain child of the Commission President Jacques Delors. The blueprint was prepared with 300 separate legislative proposals for removing the physical borders and technological and financial bottlenecks. Each proposal was to be examined by the Council of Ministers representing the 12 states. Subsequently, these were to be converted into national legislation by the 12 national parliaments. It is believed that substantial work has already been accomplished with many major measures already adopted. At this rate, the European Community is bound to be a reality before 2000.

The economic benefit for the European Community will be immense through free movement of goods and services, minimum bureaucratic interference and increase in productivity and efficiency by combining and optimizing manpower and resources within the 12 nations. It is believed that this approach will in-

crease the community's gross national product by over 5 per cent. To liberalize capital movement all major restrictions related to banking investments and finances are being abolished in the eight major states; the other four weaker currency states— Spain, Portugal, Greece and Ireland—will follow suit later. At this rate, they will have a single banking system and perhaps common currency for the entire Community in the near future.

In anticipation of this major trading bloc, large-scale buy-outs, mergers and corporate take-overs have already started. The Community is already adopting common European standards for many products and services including information, communications and computers. Common European standards will fuel a much larger growth in the market and attract interest of non-European nations. The European Community is becoming a key target for the 1990s for many Japanese and American companies. For the first time, Japanese companies are ready to go beyond screw driver technologies and introduce highly modernized facilities for assembling high technology equipment. Japanese investment is prepared to bring in substantial R&D activities in order to induct European talent. Japanese companies are willing to move away from their traditional investment base in Britain to invest in the Netherlands, West Germany, France, Belgium, Spain and Ireland. This is their commitment to the consolidated, but large, European market of the future. A large presence from Japan and America is bound to change the face of corporate Europe in the 1990s.

The entire world is watching the EEC experiment with great interest. The visible success, so far, has encouraged many to participate and gain access to their standards and markets. The next-door East European nations are in favour not only of an economic reunion but also of social and cultural reunion for the sake of one Europe again. Even developing nations, with earlier colonial links are hoping to gain from this experiment. The Asia Pacific nations are discussing a Pacific alliance to deal with the Europe of the future.

Everyone hopes to learn from this initiative to form larger regional market bloc, consisting of many nations of an area, committed to free trade, technology, economy and movement of people. This is a new phenomenon, attractive to many, but difficult to implement, because of the ongoing traditional conflicts related to religion, border disputes and economic disparities.

Asia Pacific: The Asia Pacific region includes some of the world's fastest growing nations, with a substantial growth during the last two decades. These countries, numbering about ten, are interested in simplifying their regional trade, investment flows, tourism, services, telecommunications, customs and other matters to enhance free movement of capital and technology. Their objective is to quicken the integration of the economies of the region into the world trading pattern. The Asia Pacific region accounts for more than a third of the world trade. Its combined population is around one billion and is still growing. Recent economic successes of South Korea, Taiwan, Singapore, Hong Kong and the other so-called tigers have drawn world attention to these newly industrialized Asian nations.

With large potential regional markets and rapid economic growth during the last decade, the Asia Pacific forum is getting new impetus and new ideas. As a timely and useful vehicle for greater and closer regional economic cooperation, many believe that the region needs to adopt an outward-looking approach and must not become a trading bloc. Others believe that with a large European Community trading bloc, the Asia Pacific region will also benefit by creating its own groupings. In general, the success of Asia Pacific nations lies in their ability to trade openly and freely in the world market. If they are to form a group, they will start a trade war in which perhaps no one could win.

Most of these nations emulated the Japanese model. First, they concentrated on establishing heavy industries, such as steel and shipbuilding, in a protected atmosphere and then gradually, climbed up the value and technology ladder and opened their markets to import competition. Singapore alone concentrated throughout on light industry and did not allow heavy industries to enter. In their economic development, some of these nations are where Japan was 10 to 15 years ago. In the early days Japan enjoyed total access to the American market but now with a large trade deficit American attitude has changed. There is more demand for American products. Once again to buy things made in USA is considered patriotic. This has been slowing down growth in the area.

Other nations of the area such as Thailand, Malaysia and Philippines now offer attractive opportunities for foreign investments. Their labour is still comparatively cheap and ample talent is available for training. This has forced the companies that had moved decades ago from the US, Europe and Japan to South Korea, Singapore and Taiwan to move into Thailand and Malaysia. In the process, several small nations of the Pacific have increased their GNP substantially and have built the necessary infrastructure for future growth.

Socialist Nations: The socialist nations of Eastern Europe have now accepted the reality to realign with the West and position themselves for the next century, in which there will be total social, political and economic transformation of the region. They recognize the need to update their technology base and build a market-based economy which requires Western investment and support. They do not have the hard currency to fund the needed modernization but are prepared to offer a variety of opportunities and options to help rebuild their eroded industrial base.

Three distinct activities are emerging. Among the nationalities that constituted the Soviet Union, there are many opportunities for joint ventures, collaborations and business for the Westerners. The nations of East Europe have come out with a variety of liberalization programmes to suit their needs. The third, very special one, is about rebuilding united Germany. All these efforts are reaping varying degrees of success.

The difference in the corporate culture between the East and the West is making the task of translating alliances difficult. To give an instance, an American friend of mine wanted to start an electronics business in the EEC. After a great

deal of search, he finally decided on two options: either to be closer to the potential customer base in Germany, or to be in Spain where labour is cheaper and the cost of living is lower. Just then someone briefed him on the potential in East Europe with even lower labour costs and much better technical manpower. Since his great grandparents came to the US from Budapest, Hungary, he decided to explore there. Upon further investigation, he learned that there was a company in the same business which was set up several years ago with French collaboration. They had all the necessary equipment, multi- million dollar infrastructure and over 200 trained technical staff but almost no orders.

He wrote them a letter about his company and inquired about their inclination for potential business arrangements. Back came a reply in broken English which did not make sense. He called them on telephone. Conversation also did not help much. They talked about vague arrangements to explore, transfer, develop, exchange experts, etc., but did not focus on any hard business deal. Finally, my friend decided to visit them and offer to buy 50 per cent of the company with potential marketing arrangements. His worry was how he would work with them if he could not communicate concepts. Language was not the barrier, but the business approach was.

I also have found from my association with the administration in developing and socialist nations that the management there is never direct, clear and open. They like to dance around the issue. They never come to the point. They never make a commitment on time, targets, milestones, etc. They love to keep things in a state of flux. They somehow give the impression that they do not know how to get things done. They do not know enough about packaging a deal or finishing a project. They love to analyse, argue, evaluate, discuss, document, procrastinate, but not to complete. Maybe this has a lot to do with the environment they work in, which does not give them the freedom to operate.

When Jack Welch, Chairman of General Electric, visited India for the first time, he told me, 'Sam, I am here to be kissed. I want to make a deal, but nobody seems to be interested in it.' He said, 'I have met all types of ministers and secretaries but no one has shown any enthusiasm in his expressions. No one seems to be excited.' This sums up the difference between an American businessman's openness and frankness and the bureaucratic mind—cautious, calculating and close. Some traditional administrators think that being direct is being aggressive, and being open is being naive.

If the new alliances are to be successful, both the sides will have to learn fast about each other's style of management, strength and weaknesses through open discussion and dialogue. It is only by developing a partnership at the working level that these alliances can be accomplished successfully.

USSR: Earlier, the US and the Soviet Union were both fighting to keep their R&D secrets from each other. In Gorbachov's time, however, they became willing to collaborate on large projects even in high technology areas. For example, the Soviet Union asked the San Francisco based Bechtel group, one of

the world's largest construction and engineering firms, to investigate the possibility of turning the research community of Troitsa, near Moscow, into a high technology centre. The concept was to make this similar to California's Silicon Valley. The Soviet government was willing to spend $100 million each year to develop a network of such large technology centres around the nation. Its objective was to transform its R&D institutions, dependent only on central funding, into a series of entrepreneurial ventures. For this it needed to install an infrastructure related to advanced telecommunication facilities, upgraded transportation and set up large conference centres and international hotels. The idea was to bring about a commercial orientation and create an environment necessary to translate research from the laboratories into products and services to help the Soviet consumers and their economy. This would also help develop linkages with world technology and markets.

The Soviets were ready to collaborate with the Americans not only for high technology products but also for McDonald's hamburgers and multiple screen movie theatres. A US company announced plans to open movie theatres in Moscow and Leningrad, with special permission for the audience to eat popcorn in their seats! The two ultra modern theatres would offer the citizens 20 new screens and roughly 8,000 new seats to view popular foreign and domestic movies. The theatre would feature state-of-the-art technology for projection and stereophonic sound, computerized ticketing, video game arcades and many other facilities. It was also agreed by the Soviet film agency that the new theatres would be free to show potentially controversial movies which were banned earlier.

The Soviet Union was also working on its own model of free economic zones. There are around 400 free economic zones all over the world. These are designed to produce goods of international quality for international markets. Such zones are developed to provide favourable conditions for foreign investments, as well as easy import of components necessary to export goods, to earn valuable foreign exchange. These zones also provide five to seven years' tax holiday. They normally consist of state run enterprises, cooperatives, joint ventures and companies partly or fully owned by foreigners.

The Soviet government was focusing on free economic zones in the Far Eastern regions, with initial priorities to projects which required small investments and had a potential for quick returns. In these areas, industries would be set up to produce processed foods, consumer products and components for machines, tools, and electronics. The concept was to develop Far Eastern zones into a centre of high technology interface with the Asia Pacific region for both national and international markets.

Since there is a tremendous shortage of items such as clothes, shoes, consumer goods, processed food, household equipment, kitchen appliances, leather goods, toys, etc., it was felt desirable to produce that items locally through joint ventures in free economic zones rather than bring them from the Western nations by paying precious hard currency. Similar zones were also being planned

in various other parts of the Soviet Union and other East European nations.

Rebuilding Germany: The task of rebuilding Germany will be one of the biggest events of the 1990s.

I had an opportunity to travel to East Germany three days after the borders were completely opened and Checkpost Charlie decommissioned. We flew into West Berlin in the afternoon and drove down to East Berlin and stayed there for two days. My West German friends were greatly excited about their trip. Some of them had never been there for the past 40 years but still remembered experiences of the last world war and the resultant Berlin Wall. To them, the events of the past six months, and particularly the past week, were unthinkable about a year ago. They were proud of the potential to reunite. They were aware of the challenges and looked forward to making the unification of the German people possible.

The difference between the two divided Germanys became palpable within 100 metres of crossing the old border where the Berlin Wall was. All of a sudden, our car ride became bumpy. It was apparent that the roads in East Berlin needed repair. The cars on the road also were small, noisy, polluting and unshapely. The buildings were run down, the paint and plaster was peeling everywhere and the whole town obviously needed a face lift. The streets looked ill-lit and empty. The shops had few consumer goods to display, in sharp contrast to the well-stocked shops in West Berlin just across the road. People were also less well dressed. To me, they looked a bit confused, depressed and dull.

We asked a waitress at the restaurant about her view of German unification. She said, 'I do not know yet how it will affect me personally. I expect my salary to go up and our shops to be filled with products I need. I also know that my rent will go up and perhaps my job will change. Still, I look forward to the future.' In contrast, the West German hotel worker in Frankfurt said, 'I know we will have to bail them out. In the process, my tax will go up and prices will increase. I hope the East Germans would recognize how hard we have worked to get the good life we enjoy. It did not come easy. I wish they would also work equally hard to get what we have.' I could sense in him some anxiety about having to share the good life he was enjoying. This was perhaps the view of the average worker.

Professionals and intellectuals, however, had a positive approach. One professor from Heidelberg said, 'We know this is going to cost us a lot of money. So what! There are 60 million West Germans and around 20 million East Germans. Of the 20 million East Germans, 8.5 million work in obsolete work conditions in industry, factory and offices. Assuming that we have to create around five million new jobs at the rate of 100,000 DM per job, the total cost to us will be around 500 billion DM to reunite. This is insignificant. In the next ten years, this seemingly large number amounts to less than five per cent of our GNP. We are sure we can manage this for our German land.' He also said, 'We know that united Germany is going to be larger than the sum total of the two.'

The spirit of unification was evident all over the nation. Next day the Germans had their greatest (Third) World Cup football victory which was celebrated everywhere, even in small towns, with flags, slogans and cars racing all over. Young Germans had rediscovered nationalism with new pride in unification. A young man said, 'After unification, the choice of players will become even better and nobody will be able to beat us. Not only in football but also in many other sports. We will see a new powerful German state emerge in the world of sports.'

We also visited Potsdam, full of history and palaces. At the famous Gleenicke bridge, known for exchanging spies between the East and the West not too long ago, all I saw was a lone Soviet soldier looking forlorn and lost, staring at the waters below. To me this was clinching confirmation of the end of the Cold War and the confrontation between the East and the West.

Emerging Two Worlds

It is clear from the new awakening in Eastern Europe and the Soviet nationalities that the second socialist world is beginning to merge with the first developed world, leaving behind two parts: the developed white world of the North and developing mosaic world of the South. These two worlds will have different sets of perceptions, problems and priorities. One will be after more affluence, technology and trade. The other will endeavour to meet basic human needs and find solutions to fundamental problems related to population, health, housing, education, water, etc. These disparities may lead to new tensions between the nations of the North and the South.

The economic disparities between the North and the South are obvious. Except some newly industrialized nations of South-East Asia and oil rich nations of the Gulf, almost all parts of the mosaic world are faced with major problems related to industrialization, unemployment and debt crisis. Some of these nations are also under tremendous population pressure which is affecting their environment, ecology and economy. Earlier they relied on the advanced nations of the world for help. Later they even relied on others to bail them out. However, with the world economic situation in an uncertainty everyone is cautious about their own economic health and is forced to follow a policy of sound investment with minimum risk.

The gap between the industrialized nations of the North and developing nations of the South has widened in the last decade. There have been no global negotiations on the developmental needs of the South and no political solution has been found to the debt crisis. As a result, the transfer of capital from the South to the North is still continuing. In the last few years, investment by the North in the South has been drastically reduced. International trade continues to show a trend clearly to the nations of the North, thereby marginalizing the South more and more every day.

All advanced nations see in the present awakening in Eastern Europe and the

Soviet nationalities a safer investment compared with developing nations. Even though the economies of the socialist nations are equally bad the investors find some romance in a market which was ideologically close to them, for the last four decades. They are hoping for things to be better in the socialist nations than in developing nations. One major argument is that the socialist nations have, at least, achieved the basic minimum needs related to education, health, housing, food, etc. Now they are at a stage set for economic take-off. The fundamental problems of developing nations are not in their way any more.

From the viewpoint of potential business opportunities, this argument and approach is valid and makes good business sense. To many, this is a new adventure worth exploring. It may be challenging, refreshing and rewarding. In reality, the mood in most advanced nations is very optimistic for the potential in the new awakening. This itself has led to a mood of depression in developing nations. They see the new developments as a competition which is uncalled for, at this stage.

As the socialist world moves closer to capitalism, the Third World nations are going to be marginalized even further. As globalization of trade and economy becomes practical and as the two large trading blocs, the Western nations, with their sound capitalist base, and the East European nations with their desire to integrate, come closer to each other, the Third World will take a lot of beating. The Non-Aligned Movement, one of the principal political expressions of the Third World, which was established as an alternative to the two superpowers, will become redundant.

The official declaration of the rich nations that assistance to the Third World would not be reduced, is simply political rhetoric. It is well known that the socialist nations of Eastern Europe are getting a lot of their attention. They are being included in their budget for larger investments because they offer markets which are more attractive to investors. Markets in developing nations are difficult to establish and penetrate, while the East Europeans give them easier access. The mosaic world of the South has been developing with a great deal of support from advanced nations. Now that support will move away to socialist nations and, as a result, the nations of the South will be paralysed further.

In the process, the world will be divided into two distinct worlds, as mentioned earlier: first, the world of the advanced nations of the North with integrated socialist bloc, a predominantly white world coming together for the first time in recent history; and second, the mosaic world consisting of yellow, brown and black. The realignment and merger of the East and the West will clearly isolate and divide North and South, because of three main reasons—race, religion and economy. For the first time, all predominantly white communities are coming together leaving behind brown, black and yellow to sort out their own differences. The white world may feel that they have enough work ahead of them to develop white socialist nations, who have been left behind due to an ideological divide in the past. They need to improve their standards of living substantially. In the meantime, others can be left alone.

If and when the mosaic world is ready to absorb technology, it can be picked up and integrated during the next major realignment. Until then, the white world may not want to indulge too much in matters related to the mosaic world. They want to isolate and alienate them also because they have been difficult to deal with, because of deep rooted tradition and a colonial past. There, in spite of repeated efforts by the white masters, technology has not been effective, markets have not developed and investments have not shown visible results. Most of these are newly independent nations still trying to cope with their internal conflicts, traditional value systems and ineffective administration. They might as well be left alone, to mature their markets and build necessary attitude, infrastructure and environment for the modern solutions and technologies to be effective and beneficial.

The religious overtone is very clear in the new awakening and the new alignment. The West European Christian Democratic parties are wooing the East European nations towards a form of capitalism that emphasizes Christian social values. They are already providing motivation, management, money, training and advice. When they talk about integrating Eastern Europe in the main economy of the West they are essentially talking about Christian Democratic values. Christian Democracy-led governments are already active in six of the 12 EEC nations. Their focus is to define a Christian concept of the human being, the family and the community in relation to the state.

On the one side growing secularism, the world over, is weakening the Christian movement in many advanced nations, including Western Europe. On the other side, this Christian movement may get some support in Eastern Europe and the erstwhile Soviet Union because religious freedom was repressed there for a long time. The coming together of Europe may not be just the coming together of the East and the West to create a united Europe with new world power centre for the economy, but also that of Christian faith and values. Some believe that the revival of the Christian faith in united Europe may be a response to growing religious fundamentalism in other parts of the world—specially Muslim fundamentalism. This has its own dynamics and danger.

But the greater danger is that the competition for scarce resources of the world between the nations of the South and the newly liberated socialist nations may get converted into a confrontation, if not handled properly. It cannot be handled by political rhetoric. It needs hard cash, technology and action to go with it. The world appears to be heading towards peace and prosperity may get derailed and witness a major offensive from the South against the North.

7. New Challenges: A Monumental Task

TO make Perestroika a reality in the former Eastern bloc, and to transform its centrally planned economies into economies of free markets which are globally competitive, is a monumental task, full of challenges and uncertainties.

Nothing is more difficult, daunting and dangerous than initiating change and a new order of things for society at large. Change is resisted, because it involves uncertainty and anxiety. Change is an unknown quantity, uncomfortable, novel. Management of change requires special skills to handle anxiety, conflicts, risks, innovations and creative processes in contrast to managing status quo where routine processes are known, familiar, well-established, certain and predictable. In a routine situation it is easy to be clear, comfortable, secure, safe and right. In implementing new concepts and developing new systems, delays and distractions are inevitable.

Many are ignorant of the need to change; others recognize but do not react to change. Only a very few are able to appreciate, accommodate and prosper with change. They are prepared and positioned to capitalize on the new environment and the new culture that it will create.

Never in history has there been a need to change on a scale as large as this. Never were a host of 400 million people required to move from a stultifying way of life based on authoritarian, centrally planned control, to an invigorating way of life marked by openness, freedom and flexibility. The change in the socialist system is coming both from the top and the bottom. It is coming in all spheres of activities to affect individuals, institutions and the state.

This requires a mega change with massive widespread shifts that sweep across political, social, economic and spiritual landscapes. In application, this mega change will have to be broken into mini and micro changes at lower levels, with concern for details, procedures, forms and functions. Nation-wide change comes about only with attention to more concrete and manageable tasks for mini and micro changes that will percolate down the system with a broad-based appeal. The ability to manage and monitor change, with a large number of change agents, will be a challenge before the present and future socialist leadership.

Challenge to Change

One of the most challenging parts of implementing Perestroika relates to the

management of change, which is difficult to define, in the context of the present events in the socialist countries. Change cannot be appreciated and understood without simultaneously defining the process of Perestroika, or Glasnost, and the time necessary to implement the new order. In general, change can be defined as a 'difference occurring over time' and 'the distance between the past and the present or between the present and the future'. Change also relates to the difference between the way things ought to be, and the way things actually are.

Change management has three key elements. The first relates to attitude and problem-solving which requires one to recognize that a problem exists that needs urgent solution. In the socialist nations, all the change agents—thousands of them at various levels—will have to appreciate that the present system and status quo are the problems they have to deal with. This will require vision, an open mind, clarity of purpose and a high level of tolerance, to deal with darkness and distractions. They will have to react to their gut feeling than await the analysis and advice of others. They will need large data bases and will need to interact with others a good deal to build up team work and coordination.

The second element of managing change relates to communication. Effective communication of change will require special skills to mobilize both print and television media to verbalize and visualize the change at various levels. In this process, a special mechanism will have to be built for people's participation and conflict resolution. People who are prepared to ask questions, give new ideas, conduct surveys, perform studies, analyse data, undertake audits, etc., will have to be given an opportunity and the visibility to perform. Unless a large network of good communicators is set up to encourage and enlist other enthusiastic individuals, mobilizing the entire society will be difficult. Emphasis on people's participation, rather than regulation, will alone enhance the chances of change succeeding.

The third element relates to institutionalization of change and team work. No one, no matter how charismatic and powerful, can institutionalize change by himself. Without good team work through the key change agents in politics, bureaucracy, business and administration, with common shared vision of the future, change cannot be institutionalized. It is one thing for a person to have a vision but it is altogether a different task for him to share his vision with others. To be effective, this team will need to spend long hours in understanding and articulating the vision and the difference between old values and the new values. Old values may say that people are a liability, and must be constantly monitored for their political activities. New values will say that people are assets and must be freed to explore their frontiers. Old values, that jobs are more important than products or productivity; new values, that efficiency and cost reduction need to be made the priorities even at the cost of unemployment, if the nation has to be competitive in the market. Such contrasts may shock and seem irrelevant to those unwilling to change, but unless they grasp this nettle firmly, success will elude them. For the challenge of change is not to change physical structures, but to change the minds of millions, their attitude and approach to the old way of

doing things.

Institutionalizing change and building change agents would call for building human capital. Here, the leadership in the socialist countries will need to make a radical departure from the past and broaden their selection process to bring in people who are not in close proximity to them. People who are close to the top political leadership, day in and day out, invariably turn sycophants and yes men. They dare not think new thoughts, since plodding worn-out paths ensures their survival with insecure leaders who are comfortable with a coterie of people who will not disagree with them.

I have seen, from close quarters, that whenever leaders try to bring about a change and initiate new ideas, all those who do not want change invariably complain that they have no access to the leader, he is not open to others, and he is getting the wrong advice. If proper buffers are not built, the leader gets blamed for every wrong move made in the system. In the process, the complaints pile up, political gossips have a field day, the bureaucracy joins in, and finally vested interests and lobbies take over and kill the initiative. It is for this reason that broad-based change agents are essential, at strategic places, to carry forward the new initiatives and act as a buffer between the people and the leadership.

People outside the system may do a better job of initiating change than those who are already established in the system, though the establishment will not easily accept the outsider. These change agents will have to be trained and given broad exposure and information to carry their collective messages downwards. The main task is to identify, promote, support and reward creative change agents and allow new managers to try new alternatives to uproot or change outdated notions and create a new environment for dynamism. In the process, even mistakes will have to be rewarded, initiatives recognized and invisible contributions appreciated. To keep the process of change alive, there will need to be continuous review of the performance of change agents and their recruitment, and identification of barriers and bottlenecks.

The time has come for all socialist nations to research, review and reflect on their past performance, and prepare detailed documented plans for the future, in many critical areas that retard their growth and prosperity. It is time for them to prepare a blueprint to change the course of their destiny and development, to look beyond the narrow regional interests. The direction and dimension of their change will determine the destiny of the world in the twenty-first century.

Political Reforms

Gorbachov did extremely well in initiating political reforms before economic and other reforms. He must have recognized that economic reforms need to be based on sound political foundations. To realize his vision, he needed institutions and instruments. To translate his dream into reality, he needed people and positions in place. These facilities to aid his plan could come only from the party machinery with a larger reach, broader base and deeper involvement. He

had a powerful political machinery coupled with a large cadre. But he needed to inculcate in them reorientation and rethinking, which was very difficult. This failed him and ultimately eliminated his job.

Contrary to Gorbachov's approach, in China, and to some extent in India, economic reforms were initiated without necessary political reforms. Their partial measures, consequently, have only been partially successful.

To begin with, Gorbachov held a major Party Congress to allow a national debate and dialogue and to involve party workers in understanding and appreciating his new approach. Having communicated his vision openly to the party forum he moved on to strengthen his power base. He called for free elections and changed the system to the presidential form with total authority and autonomy. Simultaneously, he also kept international politics alive by putting in high gear his negotiations with the Americans on arms reduction. He also travelled a great deal within the country, to keep his finger on the pulse of the nation, and also abroad. Meanwhile, he put his chosen lieutenants in key positions to collect data, get the feedback and implement reforms. Throughout, he used the media effectively.

During the first two years of his term, Gorbachov spent a lot of time listening, communicating and developing a consensus within the nation. Thereafter, he began to free the media and allowed people to vent their grievances. He gave them a platform which was not available earlier. Once he had the media to voice public opinion, he started to emphasize the need for substantial curtailment of the central authority's control over industry, trade, agriculture, appointments, etc., and economic reforms to increase productivity and profitability. When the other East European nations, where also the kind of liberalization proposed by Gorbachov was badly needed, joined the Perestroika bandwagon, his position at home was strengthened further. Gorbachov was the first Soviet leader who talked about systematically reducing the size of the government and cutting down the bureaucratic perks, privileges and expenses. He thus gave the people the sure feeling that he was empowering them to decide their own destiny.

Gorbachov's first setback came when some of the constituent republics of the Soviet Union wanted to secede. Many knew that this was the beginning of the break-up of the Soviet system. He travelled extensively to these areas to express his point of view. The Soviet Union, however, did finally break up into independent nations and formed the Commonwealth of Independent States (CIS). How the break-up will work in the long run is anyone's guess.

The key lesson learned is that political reforms must go hand in hand with economic reforms. In spite of well-planned political strategy, the slow pace of economic reforms drove the Soviet Union to division.

Administrative Reforms

In implementing generational changes, administrative reforms are critical. They are also a monumental task. If well executed, they can generate a lot of hope

and expectations; if done haphazardly, they can get diffused, distracted, and derailed. To make restructuring a reality, administrative reforms will have to be implemented, in a major way, in all aspects of public life. And this is not done by forming committees and shelving their reports. It is easy for a group of experts to recommend, but very difficult to implement the recommendations throughout the country.

At this stage when the socialist nations are undergoing total restructuring and realignment with the dawn of democracy and freedom and globalization of markets and economy, it is imperative that administrative reforms are recognized as the key activity to build the new institutions and a new order. The leaders implementing these reforms will have to do without much analytical background which is essential for implementing reforms. They have to do without a wealth of experience, insights, understanding, awareness and knowledge; they will also be handicapped with no background of taking bold decisions. They will have to be bold enough not to lose heart when major mistakes are made. Unfortunately, individuals with experience in the free enterprise system and free market economies are not available in the socialist nations. The mind-set in the socialist system is so very different that encouragement and enthusiasm will not go far in developing the gut feeling for decision making and availing of instant answers. This is going to be one of the greatest challenges for decades to come.

The critical element is timing. It is the only thing that matters in speedy implementation. During transition, there is bound to be a great deal of confusion all around and many vested interests would be waiting to move in. In such times, one cannot afford the luxury of a fact-finding junket. What matters at this stage is quick action and not a detailed analysis.

Promises made by the political bosses to transform society, by restructuring and realignment to practise a more open democracy can only be translated into action by the painful process of redefining minute details related to administration, authority, autonomy, flexibility, policy, procedures, etc. Without these, the system will survive only for a while on euphoria and excitement. The hard realities could hit too soon if the day-to-day administration cannot change direction and move on to a totally new work environment, work culture, work standards and work ethics. The fruits of the rise of democratic values will reach the masses only through economic modernization which can take place only through a new administrative thrust.

Generational change has to be evolutionary, but rapid, with focus on management of change and change agents. This will call for ability to mobilize, motivate and manage a large number of change agents strategically placed. They will have to focus on clarity of objectives, accountability, decentralized decision-making, organizational autonomy, flexibility, public commitment, public audit, increased productivity and efficiency and communication and coordination to implement reforms. To make this workable, each major administrative procedure will have to be flow-charted to examine the relevance of the objectives and values in the earlier system versus the new initiatives and new de-

mands for the future. The flow-charts may have to be modified or even scrapped in some instances, to begin with a clean slate. Effective training will have to follow after this step to teach the change agents the new way of doing things. This is easier said than done, especially when it is a question of mobilizing a large administrative work force that has been lethargic and stagnant for ages. Any new initiative after the initial excitement will ultimately fall by the wayside if new systems and new procedures are not in place to implement them.

Administrative reforms will have to be approached from a variety of angles, such as new roles and relationships, new policies and programmes, institutional restructuring, and personal and financial flexibilities. As the political structures change at the top, new roles and relationships will have to be designed and defined as the starting point for administration and management. Political slogans and public speeches alone will not be enough. Each new role will have to be clearly defined with appropriate responsibilities, authority and various institutional and organizational interfaces. Who does what to whom, when and why in a large organization could become a major bottleneck if the relational structure is not made clear to everyone. It is also a part of the openness that is being talked about so much in the East European nations. For example, routine details like: What comes to the office of the chief executive and the president? How much is decentralized and how much is centralized? Who makes decision on investments, institutions, foreign exchange and key appointments? How to improve coordination between the new office of the president and planning process and the ministries? What is the role of those who have been responsible for administrative reforms? Who will restructure the unprofitable industries? Many subject matters could be left to various states and nationalities and do not need to be referred to the party bosses. What is the role of multiple parties in the new systems? How would the leader of the opposition party intervene in the government to install checks and balances for a public scrutiny? These questions can be clarified only through a better definition of the new roles and relationships.

In a centralized power structure, and specially in a single-party political environment, decision-making is simpler and to some extent expeditious. It is generally believed that dictatorships help speedy implementation of decisions, with fewer points for checks and balances. A multiparty system, being more open and decentralized, demands scrutiny from too many vested interests. At times, it becomes difficult to separate fact from fiction. For this, some institutions will have to be strengthened, while others will have to be weakened. Along with this, the roles and relationships will have to be defined at the lowest possible level in the management structure—all the way down to manufacturing enterprises and distribution and delivery systems.

When one company is acquired by another, a whole new set of systems are put into place to redefine roles, rules and relationships. This includes policies on personnel, purchasing, accounting, vacations, benefits, insurance, budgets, sales, commissions, marketing, advertising, and distribution. And here we are

talking about a nation, with hundreds of millions of people, moving at the same time in different directions. It is almost like a democratic enterprise acquiring, or buying out, through some unknown leverage, a socialist system that is stagnant and inefficient. It is up to the new owners to reform and restructure the enterprise. Only, in this case the leadership and the ownership have come from within, with no experienced outsider.

In my judgement, in a society like that of Russia, at least 500 new key jobs will have to be rewritten with a clear understanding of interactions and interfaces with various functionaries and institutions. This is a monumental systems engineering task, and cannot be left unattended, since time is of essence. When I think of this, I am frightened by the magnitude of work required to restore and reorient enterprises and individuals. The difficulty is all the greater, given one's experience that even a minor change in the corporate office administration creates a whole lot of perturbations.

New policies and programmes will have to be developed mainly because almost all current policies reflect old values, old structures and old thinking. The key questions would be: Are these policies and programmes relevant for the new order? Are they based more on earlier controls, as opposed to the new liberalization and development thrust? Do these take into account the long-term objectives of openness, accountability and restructuring? Do they really involve people individually or collectively? Do most of the forms and functions make sense now?

In all developing nations, for example, the procedure is needlessly complicated and, mostly, unnecessary. Forms are too long, they ask for information much of which is irrelevant, and are confusing. These forms and questions are designed to help the gatekeepers in the system, who block everything, and sometimes demand a basis to move the matters forward. These systems and procedures are predominantly rule-based and not result-oriented.

In 1986, I wanted to open a bank account in India. Not having had an opportunity to open a bank account in India before, I did not know the procedure. At the bank, I was told that I must have an introduction from two persons who had current accounts there. This was news to me. I told the banker, 'It is my money; I have earned it. In fact, I would like to know the credentials of the bank.' He said, 'Well! this is a Government Bank.' My retort was, 'So what?' These colonial practices were not a part of my thought process. In the US, where banks have to do a great deal of marketing to lure customers for their investments and savings, I was used to a different approach. If I were to open a new account in a US bank, they would not only offer me a cup of coffee but would also give me a small gift to take home as a memento. When I mentioned this to a government official, he said in justification of such procedures, 'You can do away with this in the US but not in India. Conditions here are very different, and these procedures are meant only for the Indian environment.' What he was saying in other words was: 'We do not want to change, then why should we simplify it?'

Three years ago, one morning a letter for me arrived at my office, marked ur-

gent and confidential. It was hand-delivered in a sealed envelope. Being busy in a meeting, I requested my secretary to go through it and give me a rundown. The letter, it turned out, was in reaction to my views expressed in a pre-recorded interview and telecast that morning. In the interview, I had casually mentioned that the money order form used in India is too long, that a piece of paper no bigger than half the size of a normal postcard would suffice, with such information as the sender's and payee's name and address, the amount of money, and a one-line message. Reduction in the size of the money order form would not only simplify it, but would also cut down on the requirement of paper. In response to my view, one of the officers of the Postal Department had dictated this two-page note promptly, justifying the length of the money order form. The gist of his argument was that because of multiple languages and other special considerations in India, we must have long money order forms. My quick response was that I could not afford to read that letter. I knew, if I read it, it would sound convincing and I might change my view. I preferred not to take that risk. I still believe that the money order form in India is too long.

When I had newly returned to India, once I went to a fancy restaurant with a couple of friends. At the end of our meal, I was surprised to see a stack of papers to sign. There were four separate bills for soup and salad, main meal, dessert and coffee—each with four copies. A total of 16 pieces of paper for one miserable dinner. I told the waiter, 'I do not intend to sign all these papers.' I said I would not sign more than one bill. Instantly, I created a bit of drama in the restaurant. I said, 'Why do you want me to sign so many pieces of paper especially when there is a shortage of paper in the country?' 'This is what our management wants, sir', said the waiter. I said, 'Isn't your management interested in saving money and increasing productivity? Isn't your management interested in preserving trees to save the environment in this country? Do they like to cut trees to get the pulp for this paper?' It was clear that he could not follow the direction of my argument. He was merely doing a job assigned to him by his bosses and the larger environmental and productivity equation was not part of his job. Finally, the General Manager of the restaurant came and apologized. He did agree that there was no need for all these pieces of paper. He agreed to my signing just one paper and we left. After a month, I checked again and guess what? They still use four copies of a bill for every kind of food you order.

Some time ago, there was a US Television team working on a programme on 'Software potential in India'. After completing their interviews with some of the key software players in Delhi, they thought they would shoot a bit of the Taj Mahal to link software and India in the minds of the American audience. I concurred, since the Americans are used to relating the Taj Mahal to Indian images. When they arrived at Agra, they found that they could take still pictures of the Taj Mahal but not a moving picture or a video film unless they had written permission from the Government of India, which could be obtained only in Delhi. They came back disappointed. They could not imagine why a tourist is discouraged from taking video memories back home. On enquiry, I was told that the

restriction on video cameras was because of the potential threat from terrorists, and other valid reasons.

Similarly, when I went to the Konarak Temple in Orissa, I photographed a sign which says, 'Cameras with tripod stand are not permitted inside the temple complex.' They were allowed only with permission from Delhi. Upon my return, I sent a copy of this photograph to the appropriate authorities and wanted to know the reason for this procedure. I was given a detailed response, but the answer still did not satisfy.

The message in all these little instances is that administrative reform is not a major priority in India. We have our procedures, and we know that these are good for us at this stage. There is no need to change and rock the boat.

I firmly believe that unless enough attention is paid to small administrative procedures at the lower levels, no amount of talk at the top will simplify life for the people, who need minimum procedural tangles, reasonable customer service, quick response and worthwhile results. In my judgement, what is required is a list of 100 most important government procedures that will fuel democratic norms, improved customer service and market orientation. These procedures can be related to banking, land, agriculture, private property, housing, utilities, business, industry, travel, etc. These 100 procedures need to be clearly simplified and redesigned, to be in tune with the new values and new demands. This will have far reaching implications on administrative reforms to restructure and realign institutes and governments.

This brings us to the question of rebuilding the existing institutions. Most institutions in the socialist nations have evolved over a period of 50 years with authoritarian orientation and large infrastructural needs. Many have made major contributions in education, health, housing and in building a military infrastructure. But the institutions of the future will need to be competitive and consumer/market oriented. The science and technology institutions also will have to be geared up for a better interface with the market economy and industries. All major institutions will need to emphasize management, marketing, and productivity. Organizational autonomy, accountability, flexibility and freedom in hiring personnel and spending funds must become their standard traits. New institutional norms will have to be developed for them, based on 'management by objectives'. Because of openness at every institution, there will be more public audit. New media awareness will create further pressures to monitor the management performance. Especially the production units will be under close public scrutiny to produce consumer goods of international standards and international quality. Institutional reform will also require mergers for many institutions and break-ups for others.

Unless major reforms are introduced in personnel and finance policy in the socialist nations, their reforms will not go far. In the current scenario, personnel are assigned on the basis of patronage rather than performance; more people are employed than required; and people operate on the basis of budgets, as opposed to real financial needs. For institutions to operate with 'management by objec-

tives', personnel flexibility would be critical. Jobs will have to be open to the best available talent in the country, and not to specific cadres or connections. All department heads will have to be given a minimum of three years to perform with an appropriate supervisory power to monitor. This will require a long-term manpower planning for at least 5,000 key development jobs only in Russia. These people will have to be put through intensive training on the management of change, free market economy, innovations, risk management, leadership, team work, customer service, etc. Without a major team of people who are tuned to the process of administrative reform and have a positive mental attitude, the change from a centrally planned system to one of market economy may be stillborn.

Economic Reform

Economic reform impinges upon policy, procedures and progress related to banking, industry, labour and technology. It has to go hand in hand and must be integrated with administrative reform and political reform; it cannot be implemented in isolation. The economic considerations that operate in almost all socialist nations are quite different from those that move the global market systems. Whether it has to do with the value of money, purchasing power, interest rates, cost incentives or an understanding of these economic parameters, the socialist system of Eastern Europe is a world apart from the Western capitalist system. As part of its restructuring, it has no way but to move closer to the latter.

The ruling consideration in economic reform will have to be that the internationalization of world economy and globalization of trade will be the key to prosperity. All over the world, the focus is on growing the size of the pie rather than its distribution. If growth and internationalization have to go together, economic reform will have to emphasize productivity and flexibility with a clear appreciation of the role of technology development, service sectors, cost effectiveness, quality and competitiveness. The major focus, throughout, will have to be to free the local soft currency in favour of an international hard currency.

Most socialist nations have been trading in soft currency and are always starved for foreign exchange. Their currencies have artificially been pegged high though, in reality, they have very little purchasing power in the world market. When I was in the Soviet Union, the official exchange rate was 1.6 dollars per rouble, while it was easy to find people outside international hotels, ready to give 6 to 8 roubles to a dollar. With this kind of disparity, hard currency has become a highly prized commodity in all socialist nations. People there want hard currency to buy foreign products from duty-free shops. The Foreign Exchange Regulation Act, which is a common phenomenon in almost all socialist nations, is too restrictive, and will have to be relaxed, for them to be active in the global markets. These regulations were probably designed in the 1940s and have little relevance in the 1990s. Who gets access to foreign exchange, how

much, and for what purpose, will remain a matter of political interest for quite some time, until local currencies are traded freely for goods and services with the international players.

The starting point for economic reform anywhere is the reform of the economic administration itself. This will call for hard decision making at the capital and communication to the institutions concerned calling upon them to be clear, responsible and accountable. Banking laws may have to be rewritten, investment procedures redesigned, and the parameters related to price hike and inflation re-evaluated. Simultaneously, transition from one economy to another economy will have to be charted out in detail.

Economic reform would be meaningless without modernization of banking systems, to simplify procedures, encourage savings and improve customer service. All over the world, banking system has undergone something of a revolution in the last decade, with real-time communication networks for electronic fund transfers, automatic cash machines and computerized data base systems. The modern banking system is evolving towards a cashless society. The socialist system has a long way to go in modernizing its banking system and networks. For national and international banking to fund large projects, the facility may be comparable and adequate, but it will need a total restructuring to cater for small entrepreneurs, businessmen, consumers, home owners, etc. If people are to be enabled to appreciate the economic reforms and encouraged to increase their savings, banking will have to be oriented towards community business. The socialist system will have to get used to plastic credit cards, consumer loans, home improvement loans and personal loans. Simultaneously, many new financial instruments will have to be introduced, with innovations to include money markets, certificates of deposit, mutual funds, and municipal bonds. Imaginative innovations in banking alone will be able to attract the wealth needed to mobilize the internal resources, which will otherwise remain idle.

Enterprises in the socialist system are owned and funded by the Government. The central authority determines what they should produce. It also issues them a licensed quota for production and distribution. Rather than business enterprises, these organizations function more like governments. Their heads operate like feudal lords, with a great deal of centralized power. Most of these units are inefficient, unproductive, and unprofitable. They operate with large overheads on cost plus basis and create more employment to support the ever-growing infrastructure. In fact, they appear to be more interested in setting up more and more plants rather than in producing products. This is mainly because the infrastructure that goes with new plants, such as land, building, machinery, housing, guest houses, new offices, etc., allows easy distribution of privileges.

If economic reforms are to succeed, some of these enterprises will have to be sold to the public. This will be possible only if the governments wrench themselves from the attitude they have hitherto cultivated of seeing these manufacturing plants as large flagships of their economy. The units that have been geared to producing military hardware will now have to start producing con-

sumer goods. If some of these enterprises are sold, for an investment, to the local community and employees, it will generate additional capital. More important, the shareholders will be able to review and question the management on its performance. Only ownership by the people will put sufficient pressure on the local management to perform, which will generate internal competition. There has to be liberalization internally with strong competition for the local market amongst the local companies, before they are exposed to competition from external multinationals in the internal markets. It is like nurturing one's own child to put on some flesh on his bones before he is thrown into the ring for major fights.

The present company laws will also need to be modified. Licence raj will systematically have to make way for operation by market forces. For products which use foreign components there may need to be some control on production requirements until the foreign exchange situation improves visibly, but the underlying philosophy throughout will have to be elimination of artificial production quotas and other barriers to entry. Market entry should be open, competition free and exit humane, allowing inefficient organizations to die a natural death. Labour laws will need to be simplified to enable firms to hire a work force suitable to their needs and allow them a free hand in deciding remunerations. To keep innovations flowing and to make new products competitive in the world market, more corporate incubators and venture capital companies will need to be encouraged.

Once I was interviewed in Moscow on my work related to technology missions in India by one of the leading Soviet scientists, Dr. Kapitza. (His father was awarded the Nobel Prize for his pioneering work on low temperature physics.) Dr. Kapitza's television programme was aired throughout the country. This programme, dealing with a variety of subjects related to technology, management, social changes, special events, etc., is informative as well as educative.

When I went to attend the interview, I was a little bothered about a language barrier. But he spoke excellent English. He had been educated at Stanford and well understood Western management, culture and technology. Surprisingly, rather than discuss about technology to meet the basic needs in India, we quickly drifted to management, venture capital and innovations. It was quite clear that he was keen on introducing to his audience these new concepts. He was a rare person, open to modern Western concepts, and positively inclined towards change. He had the vision to see that the entrepreneurial culture, which is common in high technology companies in the West, would be invaluable in developing the economies of socialist nations.

It is the long-term vision that is important. Ronald Reagan became President of the United States with a simple agenda. He was elected to cut taxes, reduce civilian spending, establish a stable monetary policy, get the government off the people's back through deregulation, and balance the budget. At the end of his term, everyone felt that he did reasonably well on the first four issues. His economic policies were considered to be fairly simple and sometimes even seemed

unreasonable and unworkable. Reagan's approach was to privatize as much as possible, to leave decision-making in the hands of private citizens who would adjust and manage the economy better than a combination of economists, bureaucrats and politicians. His entire emphasis was on leaving a lot of these decisions to the free markets and let the markets drive the supply and demand equation. For example, reduction in taxes normally created new markets for products and services and stimulated jobs.

As regards balancing the budget, Reagan followed Friedman's view that the most important thing about the budget is the level and direction of spending and not necessarily the size of spending. The act of government spending establishes national priorities and creates incentives and disincentives for individuals and corporations. People desire that government revenue roughly matches expenditure. But a balanced budget can be seen over decades, and not just on year-by-year exercises. Deficit, by itself, was undesirable, but it would not kill the economy. Borrowing for productive purposes is better than not borrowing and not doing anything creative and productive. Reagan believed that borrowing created a certain amount of discipline in the system. In his time a lot of foreign capital came into the United States because people felt that the US was a better place to invest in.

The US deficit is of great concern to the world community at this stage. I personally feel, however, that over a period of time this will balance itself. The process may lead to some price hikes and even a little tax hike, but in the meantime, a large amount of assets will have been created. In business, happiness means having a positive cash flow. Business pressures build up only when the time to meet the payroll draws near and there is no cash to support it. The key to running a successful business lies in one's ability to meet the payroll, month after month, in spite of continuing growth, economic slumps, changing products, declining prices, increasing competition, and increasing national debts.

Small entrepreneurs need to organize their markets, improve their cash flows, manage their manpower and match their competition to survive by borrowing more. Large government organizations that deal with big budgets try to balance it month by month, and year by year. In this exercise, bureaucrats dig into small details and concern themselves with taxes on match-boxes, cigarettes and duty rebate. To support the socialist ideology and to help the poor, they may recommend higher taxes on smaller electric bulbs. To my mind, getting bogged down in such minutiae is to forget that it is better and cheaper to borrow to build community assets now, than wait for a few years and then pay inflated costs. Megametros in the developing world, for example, urgently need a mass transport system either underground or mono-rail type. But everyone avoids these projects because they are expensive. Inescapably, they will be even more expensive by the year 2000. So what are the other alternatives available? To go on postponing is not an alternative.

Cooperatives play a major role in the socialist system. In the economic re-

structuring, too, they can play a substantive role. Whatever their field of activity, the system of cooperatives will need to be strengthened further for distribution, sales and marketing. The scope for collaborative efforts and joint ventures with the cooperatives in the Western world could also be seriously investigated. It may not be well known that a large number of consumer products in the US are handled by cooperatives. Ammonia Refrigerators, Sunkist Orange and many other products ranging from fruits to cosmetics are part of a massive economy in the hands of the cooperatives in the US.

To flourish, an economy will need to generate lots of new capital. In this, a stock market is a valuable tool. Socialist economies will need to create a stock market, if not now, certainly in about a decade. In every metropolitan area, there will have to be a local stock market to enable people to invest and participate in the local economic growth. Only through a viable public stock market can appropriate linkages be organized with investors the world over and the economy made truly open and global. Internationalization of the stock market enables people to invest freely in other currencies and attracts investment to profitable spots. Today, almost all the world stock markets are interlinked. A major fluctuation in one market, which is instantly conveyed throughout the world through the electronic network, has a triggering effect in stock markets all over. The crash of 1987 at the New York stock exchange was reflected all over the world in less than 24 hours; and when it recovered, others did as well.

Manufacturing Reforms

The nature of manufacturing industry and technologies has changed significantly in the last 25 years. To design a new automobile, it used to take 1,500 engineers a total of six years. Over 35 per cent of this manpower would be engaged in engineering design activities and the rest in other engineering support activities. Now, through improved information tools such as computer-aided design equipment and improved management information systems, along with associated management methods, the same job can be done by about 300 people in less than three years. This can be accomplished only by organizing a system to do it right the first time, without wasting time on trial and error. Similarly, with flexible machining, it is possible to reduce the number of employees by 75 per cent while at the same time improving productivity, quality, and delivery. In many industries today, competitive advantages are derived from the ability to accelerate the rate of change and to adopt new products and new processes.

Customers no longer want uniform products. They prefer to have special features, options and alternatives to suit their taste. Today, every customer wants to exercise different options for colour, air-conditioners, seats, glass, windows, radio, sun-roof, special side mirrors and many other fixtures and frills that make every automobile a unique machine. It no longer makes good market sense to produce, on a production line, 100,000 cars with the same features and func-

tions. The production philosophy has, therefore, to move from economies of scale to economies of scope. On account of customer preference, and pressure for options, it is essential that the production line is designed to handle variations, instantly, in processes and priorities.

Also, with the right kind of tools, it is now possible for only six people to do on the production line what used to take 60 people. It is also being recognized that effectiveness on the production floor increases when the group involved is small, for a small group optimizes communication skills and eliminates needless delays in interfaces. The transition involved in reducing manpower by 90 per cent will be a culture shock to many. But the difficult choice will have to be made in the light of the fact that the future will belong to the global players and it will be difficult to isolate and insulate the national boundaries for inefficient, non-productive, expensive, production plants.

Industrial Perestroika will call for transformation of large industrial complexes into small entrepreneurial groups, with appropriate modern information systems and tools to manage the changing requirements. To be competitive in the world market, in most socialist nations, labour productivity will have to go up by almost tenfold. Shop floors at the factory will have to be used as laboratories to try many innovations in manufacture. They will have to work very hard to reduce the scrap rate, control failures, improve processes, quality and materials management and optimize investments. They will need to learn to dominate and develop markets in selected areas. Change will need to be implemented speedily and managed effectively by breaking up work hierarchies on the production floor. The industrialists of today will have to be converted into entrepreneurs of the future, to create a new skill base that assimilates the gut feeling necessary to take advantage of changing trends in production, market forces and consumer demands. Only private initiatives will bring the innovations and management flexibility needed to transform old enterprises into modern money-making machines.

Government's efforts to transfer the national assets to public or private companies may face rough weather, because for vested interests like government bureaucrats, political bosses and labour leaders status quo is comfortable while fighting battles to increase profits and take risks is a challenge for which they are not prepared. Funds also would be a problem. To sell companies to the public and the private sectors, a large capital market will have to be created, with appropriate management skills, to make money for the public. Companies can be auctioned off, sold to the management, merged, acquired, or spun off through the capital market.

In the free entrepreneurial system it is always emphasized that government role in business should be minimal. Government has no business to be in business. Only by turning business over to the private sector can government concentrate on governing. Socialist nations will have to make conscious efforts to bring about this transformation from government to private ownership. This may even take a decade and would require, in the beginning, periodic interven-

tion to promote the right kind of incentives.

In many countries, government controls and regulations have helped in building large enterprises based on local raw materials and resources. However, because of growth in government ownership their control remains with the political bosses and lacks economic understanding. In Indonesia, a third of the 200 state enterprises were incurring losses in 1987. Sixty per cent of Thailand's overseas debt was due to government enterprises. In Japan, the government-owned national railways run up a debt of some 30 billion dollars. While they go on losing, they get unfair protection and subsidy.

Before privatization begins, it is important to understand what has to be privatized and when. This requires special expertise. Unfortunately, this is available only in countries where free enterprise flourishes.

Resource Mobilization

The process of Perestroika has raised people's expectations in the socialist countries for a better tomorrow with more freedom, prosperity, products, and services similar to those available and enjoyed in the Western countries. To fulfil these expectations, a great deal of resources—running into hundreds of billions of dollars—will have to be mobilized from all over the world in the form of loans, equity, debt, joint ventures, bonds or other instruments and combinations. Since the pace of change and reforms will greatly depend on the ability to mobilize external and internal resources, new concepts related to stock markets, money markets, venture capital, expatriate funds, cooperatives, incubators, etc., will have to be developed. Some of the external resources could come from the US, Europe, Japan and the Gulf countries.

A lot of technology resources will also have to be mobilized to bring industries in the socialist countries on par with those in the Western world. Several multinationals in the US, Europe and Japan are eager to share technology, provided they get the same returns as elsewhere. They will set up joint ventures, provided they are comfortable with the Foreign Exchange Regulation Act with freedom to choose their priorities in international currencies. Some critical Western technologies have been denied to the socialist nations in the past to foil possible applications in defence. Consumer technologies are, however, in the public domain and are readily available.

Financial resources and technology, however, cannot be capitalized without adequate management know-how. Socialist systems do not understand enough about productivity, efficiency, costing, distribution, marketing, etc. Most of their managers are trained in theory, but lack experience and gut feelings necessary to move the multi-million dollar deals on the spot, which come only from practical experience and from living in a corporate culture which is in tune with the global business environment. Thousands of key potential managers in critical areas like tourism, finance, marketing, distribution, sales, public relations, experience, entrepreneurship, etc., will have to be developed with massive

'hands on' training programmes with modern training tools, to include audio-visuals, case studies, field experiences, interactive video, expert systems, etc. This itself will demand creation of new management institutions in all the major metropolitan cities to encourage new management methods and models. This would be the toughest of all resources to mobilize.

The engineering base in the socialist countries is not competitive in the international market. The major segment of their industry is high cost and low quality. It has been protected for a long time and now needs technology upgradation. This can be accomplished through liberalization and fiscal incentives. Liberalization is not licence to import at any cost. It is more to create internal and external competition and change the relationship between government, business and the consumer.

The technology-oriented industrial policy will have to be geared to a faster growth, product innovation and entrepreneurial environment where entry will be free, competition brutal, and exit humane. No country in the world today is capable of covering all the technology frontiers. Therefore, detailed sectoral and corporate level planning for products and technology will be essential. A special team of corporate turn-around experts will also have to be created to convert sick monolithic public sector companies into profitable flagships with technological restructuring, change in the product mix, tighter financial controls, public funding, modern management information systems and innovations. In many areas import substitutes will have to be developed and expert potential will have to be built.

Socialist nations are not used to technology incubators. Without sufficient venture capital fund new technologies will be difficult to breed. Technology incubators and special productivity centres will also have to be developed. This will require stock options and incentives for technocrats and innovators—a concept unheard of in the socialist system.

There is a great deal of engineering talent in socialist nations. But this resource can be mobilized only by creating a new climate of change in policy programmes, perks and performance parameters. Individuals with a track record for productivity, willingness to explore and take risk will have to be given a larger share of the pie. This is the essence of free enterprise and capitalism. As they say in America, 'If you are smart, how come you are not rich?' Smarter people will have to be given an opportunity to become richer to create wealth for themselves and for the nation.

Enemies from Within

Perestroika is an enormously frightening task. Its outcome is not clear even to those who are planning and implementing it. However, the direction is already set and is gaining momentum.

The enemies of change will come from within the system. These will be vested interests, bureaucracy and politicians, who will individually and collec-

tively seek to frustrate the process. Those who enjoy the perks and privileges in the present system will not want to let go of them. There will also be power-hungry politicians and people who want to settle old scores.

All those who milked the system and enjoyed the benefits of patronage and perks will have little interest in Perestroika's success. They will give a hundred reasons why it will not work and find fault with every proposed change. To give an example: there were over 60,000 items prescribed in the centrally controlled plan for production, distribution and supply to the customers. This was reduced in 1989 to 8,000. In the process, thousands of people would have lost their power to control and distribute favours. These powerful members of the bureaucracy, who would have a lot to lose in the new system, are important potential enemies to contend with.

The other power-hungry politicians will also seek to spread disaffection among people with the results achieved. The time of transition is the most difficult in generational change. Invariably, the leader who motivates has to raise people's aspirations. But it will take time to meet many of these expectations. Many disgruntled and power-hungry politicians will make use of this opportunity to make the masses feel disillusioned. All those who have old scores to settle with the new leadership will also join in and work to develop an alternative leadership to preserve the status quo or change the direction.

In a totalitarian regime, with state owned and operated media and total supervision and control on television and newspapers, it was easier to curb dissidence and distraction. Glasnost, unfortunately, makes it almost impossible to prevent rumours, misinformation and false allegations against the leadership and their programmes and accomplishments. Now, enemies can effectively launch a nationwide misinformation campaign to confuse the public. People tend to believe whatever appears in print. Modern media are powerful tools which can be easily manipulated by vested interests who have all the time for mischief mongering while the leadership is busy implementing promises made to the people.

People have short memories. They believe newspaper headlines and forget the past easily. They do not easily understand the complexity of running a government. Yet they always know how the government should be run. There are others who benefit from many government programmes but lose on one and are turned off. All these people could turn into potential enemies from within the system and become difficult to handle. There are also those who feel insecure and are jealous of others' success. They may also add to the nuisance value in mobilizing dissidents.

In a communication system that is open, fair and active, it is difficult to prevent the dissident voice from being heard. If it is not properly modulated and managed, it may blow out of proportion and may require a lot of energy to counteract. In the environment of misinformation, ultimately the truth may prevail, but in the process there may be many casualties and expensive damage. For fighting enemies from within, good media management is a prerequisite.

The main battle for Perestroika will probably be fought over the prices of

items like food, clothing, housing, rents, etc. The present outlook for pricing is far from encouraging. In the erstwhile Soviet Union and many other nations of Eastern Europe, many basic needs used to be heavily subsidized. Education was almost free and house rent negligible. This would drastically change in a market system, the best mechanism known to man for allocating resources efficiently, where prices are freely set between seller and buyer. Rising rents and prices will be a major shock to the consumers. They will not accept the argument that things must get worse before they get better.

If along with prices, their salaries were to go up, they would not have much to complain about. But it is more likely that along with prices, unemployment may also increase. Consumers, therefore, may turn out to be another major enemy from within to derail reforms. In the process of converting a centrally planned system into a free market, half measures will not help. With liberalization, price reforms will have to go hand in hand. A clear strategy to fight the enemy from within is essential to implement major reforms.

8. Developing World: Being Marginalized

Developing nations account for over 70 per cent of the world's population, spread over a hundred nations of Africa, Asia, Middle East and South America. They obtained freedom just about 40 years ago when the Cold War was beginning. They have been backward in many respects, compared with the Western nations. Some of them are groaning under poverty, excess population, shortages, inflation, unemployment and a large unpayable debt. For a while, they did get the attention of the advanced nations of the West because of their natural resources, wild life, jungles, mines and minerals. A lot of this has already been overexploited and has vanished.

In many developing nations, a great deal has been accomplished in the last 40 years. A significant portion of the resources has been used up in building the infrastructure and institutions necessary to bring about prosperity. In spite of these efforts, and support from international agencies and Western nations, most of them still face many a monumental developmental task to meet the basic human needs, eliminate poverty and improve the standard of living for their people.

They need more resources from the Western world, but now more resources from the Western nations will flow into Eastern Europe and the Soviet nationalities than into developing nations, because of geographical closeness, cultural affinity, better trained manpower, Christian values and work ethics and other factors. A massive amount of money will be spent on Czechoslovakia rather than on Zimbabwe, on the former East Germany than on Egypt. There is little doubt that in the next decade, the socialist nations of Europe will take up most of the resources and will leave very little for the needy developing nations.

Given the experience of Western nations with the barriers and other constraints prevalent in developing nations, East Europe looks very attractive to Western multinationals. Western investors feel that most developing nations, except the newly industrialized nations in Asia Pacific adopted, besides traditional colonial business practices, unsound and restricted economic policies. In comparison, they see in Europe massive reforms to apply democratic norms, multi-party systems, free and open elections, respect for human rights, free market economy and opening up of large consumer markets—probably as large as in Western Europe. Investors and entrepreneurs feel that their investment in Eastern Europe will be secure, safe and promising substantial growth.

In the view of Western institutions, they tried very hard, for almost four de-

cades, to develop resources and business in developing nations. Against all odds they deputed their key people, deployed key technologies, but did not get adequate returns. They did not succeed in a big way in building an institutional infrastructure or a sustainable market base. In the process, they took more raw material, ruined the local ecology and environment and exploited the local inexpensive labour. No major breakthrough was reported in any collaborative effort or business. They merely sold the finished products. They could only transplant technology but not transfer it.

Cultural differences interfered in a big way in transferring the institutional framework and technology. Developing nations still have a feudal and colonial mentality. They hardly recognize the value of technology for problem-solving. Their approach to science and technology and growth is not in tune with Western standards and values. Many prefer local solutions which are simple, inexpensive and suitable to the local conditions. Foreign technology, in their view, brings complicated components and alienates the local people. Modern Western technologies sometimes also fail in the long run.

The disparities between the developed and developing nations have given rise to a great deal of tension. This tension seems likely to increase further because of the recent awakening in Eastern Europe and the Soviet nationalities. If developed nations fail to give special attention to the problems of developing nations and create a similar awakening there also, the globalization of economy and trade, integration of the socialist nations and associated realignments the world over, will suffer.

Let me cite three experiences that I had in a week's time, to illustrate how active the process of realignment is. It is bound to have far- reaching implications on developing nations, though the effect of all this may not be instant.

First, a key executive from a US multinational company told me in New Delhi: 'The romance with East Europe and the Soviet Union is very high in our board rooms. Any proposal for trips, investigations, assignments and projects related to these nations gets immediate and sympathetic hearing and an early approval from the board. No one wants to talk about India or China.' Apparently, the romance with China is over. The massacre at Tiananmen Square has taken all the charm out of investing in China. Everyone is now talking only about the socialist nations. In the executive dining rooms it is fashionable to talk about one's recent trip to Eastern Europe and the Soviet Union.

Second, I asked a professor of Indian origin from the New York University about his impressions of Perestroika and the recent events in Eastern Europe. His response was: 'Our Asian academic community on the US campuses will be the hardest hit. Many professors of Asian origin in mathematics, social sciences and pure sciences may be losing their jobs to the potential East European and Russian academics.'

Third, when I tried to get a friend, who is an authority on telecom training in the US, to visit India during the summer on a lecture tour, I was told that he was booked for Eastern Europe. Another professor who was suggested in his

place had already cancelled his tour to India because he was to spend the entire summer studying and visiting the Soviet Union.

It is this type of valuable, timely, knowledge-intensive interaction and human resource that is going to be of concern to developing nations, and not just money from the World Bank or other organizations.

Problems and Priorities

Among the ills affecting developing nations are pressure of population, illiteracy, poverty, unemployment, resource crunch, low level of technology applications, poor infrastructure for communication, transport and water, and poor human services related to education, health and hygiene. They are predominantly agriculture-oriented. They have a great need to bring new technology to improve productivity without increasing unemployment. They have to find new jobs for their increasing population and to improve their standards of living. In many developing nations, however, there is not enough political will, discipline, and desire to work to tackle some of these formidable problems on their own. Poor administration with no initiative, no innovation and no action is at the root of these problems.

In developing nations, life is a hard struggle to survive. People at the bottom work long hours to get two square meals. Many walk miles to collect fuel and fodder. They carry loads on their back, carry bricks on their head, break stones in quarries and work on small farms. Life is not rosy for people at the top either, because in the absence of managerial and administrative talent, they also are forced to work long hours. Top bosses are always too busy because everything is centralized for decision-making. However, people at the middle level tend to have a different work environment and attitude. They are the most bureaucratic, slow, insecure and indifferent. They eat up the resources which are meant for the poor at the bottom.

In a developing nation, the government has a finger in almost every pie. It invariably is the largest employer, the largest producer and the largest buyer. It not only builds infrastructure like railway, communications, education, health and tourism but even manufactures bread and does these things most inefficiently. It builds large monolithic structures that are overstaffed, overequipped and overbureaucratized. The inevitable result is the growth of vested interests, corruption, leakages, delays and distortions. Labour laws also are rigid and do not allow a system of incentives and disincentives that would help increase productivity. In consequence, mediocre elements flourish. Everyone is interested only in self-promotion and self-aggrandizement.

Bureaucracy grows in size and shape to preserve the antiquated procedures and conquer more territories. In India, once we were experimenting with a programme management concept. Our goal was to complete a specific project in a specific time-frame with minimum staff. We hired a senior executive who agreed to our approach. But in two months' time there were all kinds of people

floating around in the organization. Our senior executive felt that he would be effective and get respect from others only if he had at least four officers reporting to him directly. This hierarchical reporting need to satisfy one's status went down the line. Ultimately we landed up with 60 people with 20 peons and drivers for a project which perhaps required only ten professionals. Approval for these 60 people was not a problem because the number was within the prescribed norms, ratios and manpower guidelines.

Also, executives in developing nations are more interested in setting up large projects and infrastructures than in producing products or delivering services. Everyone is keen to start major programmes for a large factory, power plant, irrigation project, etc. Investment is spent on starting a township in the middle of nowhere, more like an island of affluence in a sea of poverty. At the end of it, when the product emerges out of the production line, it is too expensive. Interested parties by now have made their money in land deals, construction, capital equipment imports, and other wheeling dealing, and now no one has any interest in producing goods competitively. One result is that there are many plants with additional capacity which are, in effect, under-utilized. There are more plants than orders in hand, yet there are people who want to set up more identical units. Duplication of efforts and equipment is a normal phenomenon in developing nations. I have seen equipment ordered in a hurry from suppliers abroad but not opened for months after receipt, and if opened, not installed or used.

Development demands clarity of vision from people at the helm. Developmental programmes often suffer because projects are not well defined, there are no measurable, deliverable, tangible milestones for products and services, and dedicated, committed and knowledgeable people with appropriate funds to spend are scarce. Even the few who are available are driven to frustration because of lack of flexibility and autonomy to implement and lack of trust and confidence to explore new frontiers. With talented young information workers, it is essential to recognize that hierarchical management, bureaucratic controls, traditional work environment and distrust of exploration will never deliver results.

To appreciate and apply the appropriate modern technology and tools to cater to the people's needs calls for initiative and the right attitude. In developing nations, vested interests in collaboration with politicians and the bureaucracy are positioned to take advantage of large government contracts for foreign products without worrying about the infrastructure to support and maintain it. They create conflicts and confusion to snuff out any initiative.

For example, there is no reason why there cannot be a grazing policy in cities which prevents animals roaming around on public roads. This will ease traffic and increase the green cover. But for one reason or another, this is not done in many nations.

When the railway reservation system was sought to be computerized in India, the labour unions strongly resisted it. Now that computerization has been successfully implemented, people appreciate the improvement in services. Even so,

in banking and other areas computerization is being stiffly resisted. The computer is used more as a calculator in an Indian bank than as a tool for electronic fund transfer. Resistance to technology and change would have been minimal in developing nations had they paid more attention to education and the service sector than to industry and its infrastructure. Major dams, steel mills and large plants were considered fashionable in the days when these nations acquired their independence, and they spent their financial resources on these mega projects. These projects did not create enough jobs. More important, they diverted attention from development of human resources.

If after independence, India had given the right priority to the prevention of infant mortality and eradication of female illiteracy, its population would have been no more than 650 million and not 850 million as of today. Even today, many developing nations give more attention to higher education and industry than to literacy and health services. They spend more on university education than primary education because it is fashionable. Human services are still not seen as the service industry of the future.

The backlog in implementing minimum needs programmes is such that it can be made good only with a missionary zeal. The infrastructure for the mission will have to concentrate on new technology applications and information systems. In operation, there will have to be a strong local and national political commitment to meet the targets, understanding of grassroot realities, sound management, optimum use of modern technology tools, talents of intellectuals, professionals and technocrats, cooperation and linkages between the various agencies, and increased communication and close involvement of the people, especially youth and women.

In working with the people, there is no substitute for endless enthusiasm and optimism, along with faith in people at large. When results do not become visible early and there are unpredictable delays, it is easy to get frustrated, blame political interference, bureaucratic tangles, resource crunch, vested interests and lose all hope.

The problems in developing nations are much more complex and need far more analytical tools than have been used in the past. Earlier approaches have been based on Western experiences and political promises without giving due consideration to the many facets related to environment, ecology, resources, rate of return, new jobs, etc. Political debate on many of these issues has been going on for decades. Everyone has his own views on what should be done and what should not be done. Very little analytical thought has, however, gone into creating the large data bases and information systems for problem solving and productivity.

Take the problem of floods which affect millions. No one has accurate, scientific and timely data base on the flow, volume, storage, drainage and various other highly complex parameters needed for computer modelling, analysis and problem-solving. Whatever data base is available is obsolete, biased and incorrect. Effective problem-solving in this matter requires a lot of new technology

and analytical tools which are available only with the Western nations. Similarly, weather forecasting now needs a powerful supercomputer, available only with a handful of advanced nations. Without friendly support from the West, the problems of developing societies, which are becoming increasingly complex, are going to be difficult to deal with.

Developmental Model

Since most developing nations obtained their independence only recently, their political systems basically follow Western models—either the democratic system of America and Western Europe, or the socialist system of the erstwhile Eastern bloc, with minor modifications wherever there was a strong local leadership. The economic systems they adopted, accordingly, were either that of free enterprise or centrally planned with some variations to mix and match, based on local conditions.

Many developing nations have three societies, related to agriculture, industry, or information, all three thriving side by side. The information sector comprises people engaged in business, administration and bureaucracy. In India, their number is estimated to be almost 50 million, which is almost as big as the population of some European nations. The agriculture sector, with the largest number of people, forms the backbone of almost all developing nations. The prosperity of an agricultural society depends upon the availability of water, and of an industrial society, on energy. An information society, similarly, needs communication and computers. To expedite the process of modernization, things must be done in tandem and simultaneous developments provided in all three areas.

Some of these developing nations have old civilizations with thousands of years of ups and downs—material prosperity, agricultural achievements, social and political conflicts, examples of excellence, struggles for development and poverty. They have given the world major religions, advanced mathematics, logic, astronomy, and medicine. Yet they remain in a developing stage, with considerable poverty.

In attaining modern-day development, all nations have passed through the same set of stages in the same sequence with slight variations in time, duration and the rate of growth. The developmental process always takes place sequentially, independent of historic and cultural conditions. Even countries which attained great eminence in the past cannot attain development other than through these sequential stages. There may be some variations on account of local conditions, customs and circumstances, but essentially they have to follow the same paths and patterns that the nations of the West have followed.

Every nation begins its journey of development with predominantly traditional systems characterized by poor products and poor technologies. At this stage, most people are employed in agriculture and power is normally vested in the landlords. The right kind of education, infrastructure, and institutions will put them on a developmental track. Along the way, they will encounter a great

deal of resistance, conflicts and delays from the old guard within the system and various interested groups. Before they reach the stage of mass consumption, they also have to learn to deal with modern technology, mass production, mass merchandizing and to develop appropriate human resources.

In modernizing developing nations, the advanced nations of the North have played an important role by providing the model, technology and investments. To many they have given a road map for industrialization and the infrastructure. When nations of the North were trying to meet the basic human needs, technologies were substantially different. With modern transportation, communication and machining, it is easier to meet such needs as water, education, food, shelter, health services, etc. But limited financial and managerial resources, the time constraint and an increasing population, make it difficult.

Various models have been analysed in the past for a suitable development. I have seen and experienced three separate models in China, Brazil and India. They vary in their approach to problem-solving but essentially aim at expansion, growth and prosperity for the masses. In spite of substantial differences, I am one of those who believe in brute force methods. One can analyse, plan and organize but when it comes to implementation, there is only one way—and that is to start doing it, against all odds. Start implementation, and learn along the way, through trial and error. Other developmental models are also available from Japan, Germany and Singapore.

During my several visits to China which started in 1980, I saw a different pattern of development emerge. China had been a closed society for almost four decades. Now, with four pronged modernization programmes, it was preparing to open its doors to foreign tourists, outside technology and external investments. It was clear, while travelling in China, that through their commune system, they had achieved success in providing the basic minimum needs of food, clothing and shelter. But they had to pay a heavy price in the form of the Cultural Revolution. They had a long way to go in modernizing their economy and industries. In recognition of this, the Chinese leaders were preparing for a liberalization process. They needed Western technology and trade.

During my trips to Beijing and Tianjin, I came across a large number of technology experts who were brilliant, but had lost contact with the English speaking world. On this account, they were feeling inferior, handicapped and, at times, frustrated. Their human energies and enthusiasm had been bottled up for almost four decades. They were eager to learn and listen to what was happening outside their world. To meet the basic human needs they had had to live in a communist environment and ideology for too long. Their natural entrepreneurial initiatives had been curbed. Now with an opening of the system, Chinese business was booming. Even a ten-year-old boy was chasing us to sell old coins for American money. They were feeling liberated and were ready to experiment with new ventures. Five-star hotels were being built all over the country and joint ventures were being signed.

China for a while was the darling of the American business world. But this

changed with the incidents at the Tiananmen Square. China decided to push for economic modernization without political reforms to go with it. Their model was to focus first on the needs and then to go on an expansion spree.

Brazil decided to liberalize and move towards growth and expansion earlier. The price it paid was phenomenal inflation, a crippling national debt and near-total economic disaster. Inflation in Brazil may run into 2,000 per cent per year. Recently I met a friend from Campinas, with whom I had spent a fortnight in Brazil in 1977. In a reminiscent mood, I told him, 'I still have some local money worth $20 from Brazil that I had kept for memory's sake.' He said, 'With inflation during the last 13 years, that may not get you even a postage stamp.'

In contrast, India's economy has been reasonably well managed for the last 40 years, and democracy has taken firm roots here. Freedom of speech, human rights, etc., have been maintained and managed to everyone's satisfaction. However, the basic human needs have not been met. Over 200 million people still remain very poor, the population growth has not been checked and about half of the country remains illiterate.Post-independence India went after big projects and ignored human services like health care and literacy, which has worsened matters. In spite of the young people being exposed to modern technology and the media, the benefits of development have not percolated down to the lower levels.

All these developmental models depend on a variety of parameters related to the form of government, infrastructure, individuals, investments, and institutions. They can only provide broad guidelines and something of a road map to development, but they cannot deliver in isolation.

Institution-Building

To be able to respond to the pressures of rapidly changing technology and management, developing nations need strong modern institutions. These institutions form the backbone of democratic functioning for law and order, defence, security, industry, commerce, education, technology and many other related activities. The Western nations have far more experience in these matters because they started earlier. In advanced nations, institutions with firm foundations are built for ordinary citizens to function and flourish. Contrarily, in developing nations, because of poor institutional framework it is difficult even for an expert to function and survive.

In developing nations it is common to find institutions where doctors do not prescribe medicines, teachers do not teach, utilities behave erratically, and even judges do not give judgments properly. We had experience of this in our literacy mission in India. We were visiting a major city as part of our review programme. One bright young officer greeted us in the lobby of our hotel and introduced himself as the officer in charge of the literacy programme in the city. When asked how the programme was faring, he answered, 'Excellently'. He proudly declared that they had opened hundreds of new centres in the past six

months.

We were impressed with his enthusiasm and decided to see for ourselves. It was around 8.00 p.m.—the right time for the evening classes. We scouted around by car for almost 90 minutes but did not find a single literacy class in progress. Finally, at around 9.30 p.m., we stopped at a place where a sign hung declaring the message for promoting literacy. Apparently, this was one of the places for our literacy classes. As soon as our car stopped, the local people surrounded us. They were eager to talk to us. I asked, 'Are you attending the literacy classes here?' They said in one voice, 'No'. An old man said, 'This class has never operated. No one has ever been taught anything here. All we know is that someone comes here at 2.30 p.m. and leaves at 3.30 p.m.' On further probing, we found that this was a routine practice in the area. However, instructors were paid, money was spent on books and transport allowances were encashed: but no one was being made literate.

This is quite common in many developing nations. People have developed ingenious ways of beating the system and making some quick money from government funds and programmes. Not every government programme is like this, of course, but there are many of this variety. The bottom line is that the infrastructure just does not work in remote areas without committed people and tight supervision. Even in urban areas there are universities which do not conduct examinations on time, delay convocations for years together, and where students are always agitated on some count or the other. These are indications of a weak institutional framework. People are quick to blame others, but are not prepared to spend time and energy in building institutions that could deliver the goods.

Good institutions are built by people with vision and values who have a sense of continuity and commitment. The founders of any Institution have to be strong persons with imposing personality, for ultimately, they have to make these institutions work on their own steam. The quality of any institution depends on the quality of its people, which in turn, depends on the quality of life. The quality of life in developing nations being what it is, where it takes so much time and energy just to survive, is bound to reflect on the institutions and their infrastructure.

There are also many institutions run by voluntary agencies, independent foundations, public interest groups, etc. They are supposed to provide checks and balances which are much needed in a democratic system. Institution-building is a complex task, which deserves a lot of attention and help from the advanced nations, not only in developing but also in the socialist nations.

Success Stories

Singapore is a singular success story of the progress made by a developing country in the last decade. Several other small and middle- sized nations of the Far East also have benefited from export-oriented liberalization strategy, par-

ticularly Hong Kong, Taiwan and South Korea, but Singapore is special because it is a young, clean, small and manageable country of around four million people. I visited Singapore in the 1970s when it was more like a typical China town. Now it is as modern as Chicago or Dallas, with huge sky scrapers. In Singapore, everything seems to work. From the airport taxi to the hotel shops, restaurants, business offices and banks, everyone is eager to help with a smile. The city is full of young people, enthusiastic and energetic.

This has been made possible by a strong leadership, with a clear vision of the future and a commitment to make things happen. The leadership apparently had the clarity of purpose and support of the people to implement their ideas. It has been a great management exercise in planning and executing day-to-day policies and programmes.

Singapore has been built with a lot of hard work by many dedicated local citizens and expatriates from the US, Europe and other parts of the globe. It has now become a major business centre and world capital for the computer disc drive manufacturers. Singapore produces around $5 billion worth of hard disc drives every year. It is indeed a Winchester city. It has all the major multinationals operating in style. Corporations like McDonald's, Pizza Hut, etc., have loaded the street-corners with clean, standard, fast food chains all over the city. Many international banks have now moved in and the stock market has expanded substantially.

Many say that the people of Singapore are too materialistic. But then all new generations of people of my variety are. And what is wrong with it, as long as they are clear about their values and life-style? Some also say, 'It is OK to develop a small city like Singapore but a large country is an altogether different matter.' True, but there is a lot to learn from Singapore. Its underground metro project, recently installed, is one of the finest urban mass transport systems in the world—fast, efficient, accurate, clean and inexpensive. Why can others not do it? I am sure there are a hundred and one good reasons for not doing it. But the fact still remains that Singapore has done it and is on the way to build a better paradise for the Far East.

I admire Singapore for its young people with their tremendous enthusiasm and confidence which is mirrored on their faces. They are the future and they are proud of their city and the country. The entire world has noticed the strides it has taken in the last decade. Singapore may not be able to keep up the same pace; but all the same, all that it has achieved in such a short span of time is nothing short of a miracle of modern management and modern technology.

Technology-Tension

Almost all modern technologies related to transport, communication, information, health and consumer products have come from Western nations. These technologies came to developing nations either through direct arrangements between government and multinationals or through private entrepreneurs and com-

mission agents. Most of these technologies are designed to bring in finished products or kits to assemble the products locally. For large vested interests and the import lobbies, signing a collaboration with Western multinationals for technological know-how was an easy way to make quick money. They had no interest in developing technology locally or in transferring it for future benefits. As a result, very little technological development took place locally. In many developing nations, traditional colonial practices still prevail, such as taxing finished goods at a lower rate and the components at a much higher rate. This encourages people to import finished goods with value added abroad, instead of importing components to which values are added at home.

Some developing nations have emphasized on programmes to develop self-reliance in critical modern technologies. At times, the concept of self-reliance has been carried too far to prevent anything Western and useful from entering the system. In the name of self-reliance, people have spent years developing products and technologies which are obsolete and useless

Self-reliance is needed in many developing nations to maximize values added at home, to create jobs locally, and to build an infrastructure of local talent. But self-reliance does not mean closing the doors to foreign technology and investment. A country like India with her 850 million people is bound to have at least eight million smart ones. Thousands of new graduates are coming out every year in disciplines like computer science. It is important that India uses them effectively to develop products and services needed at home, instead of losing them to other nations. For this, self-reliance in the technologies of tomorrow like communication, computers, software and information is extremely important. Self-reliance in these areas means buying the best available electronic devices from the world market, such as the most powerful micro-processor and the fastest memory devices to build products and systems at home to suit the local conditions.

In today's fast-changing technological world, no country can achieve self-reliance in everything. Self-reliance does not mean isolation. It means cooperation of the right type. Earlier, technologies were capital-intensive and required a lot of equipment and machinery to build products and services. Now, with soft technologies, where knowledge is an intensive part, the emphasis on self-reliance becomes even more important for developing nations like India and China where a great deal of potential software and mathematical talent is available.

Saudi Arabia, while modernizing its telecom network, imported a lot of advanced technologies and products from the Western world and also people to maintain and manage these networks. Most developing nations cannot have this luxury of importing people. They have no option but to develop their capabilities locally.

Some of these technologies are so complex that they cannot really be transferred; they can only be transplanted. It is only by participating in the design and development activities that one can get the real feel for the products and

technologies needed to modify and maintain. Participation in design also gives the pride of ownership, creation and emotional attachment to technology and to products for future applications.

Developing nations are now placing greater emphasis on science and technology and setting up more institutions to promote science. However, these institutions do not necessarily develop a scientific temper or a scientific culture. They, at times, operate in isolation without proper linkages with universities or industries. They hardly appreciate customer needs and market demands. My two favourite examples relate to the postage stamp and the electric plug. In spite of there being thousands of capable chemists and adhesive experts in Indian laboratories, the Indian postage stamps never stick. Similarly, though we have capable electric and mechanical engineers, the electric plug that the Indian companies manufacture never quite fits. In a market of scarcity, products of poor quality sell, because nothing else is available.

Technology-tension is evident in developing nations, not only because of old traditions, but also because of inability to decide what kind of technology to use, when to use and how to use. Some technologies are seen as useful and others as useless. There are very few technology change agents who are capable communicators in pushing their viewpoint. As a result, the will of the political bosses and social scientists prevails. They have no experience or feel for technology and this results in a limited, narrow and biased viewpoint.

Many technology deals in developing nations are made on political or other considerations. As a result, technology and knowledge never get transferred. Take India, which boasts of having the third largest scientific manpower in the world. When India decided to purchase the crossbar telephone switching technology from ITT, Belgium, many believed that they were being sold a lemon. It took years to Indianize the technology and several years and millions of dollars to productionize it. At about the same time technology changed from electromechanical crossbar to electronics digital and India was once again ready to acquire the telecom switching technology in the international market. This time the lucky winner was CIT Alcatel from France. In other words, the technology for switching was not transferred, but the crossbar plant was planted knowing very well that it might become obsolete before it began production.

The scientific community in developing nations is normally small, fragmented, silent and ineffective, and is totally cut off from imports and applications of technology. Scientists may be kept busy in research activities funded by government or multinationals, but they are kept away from large-scale production and purchase decisions. They thrive on presenting papers at international conferences than on bringing technology to the masses. The net consequence of this elitist attitude is that the products developed in these nations do not find large-scale applications or meet the international quality standards.

Though a lot of work on technology goes on at various national institutions in developing nations, one hardly sees technology being used effectively for day-to-day living. The idea is not to invent more technology and tools but to

learn to use tools already invented. There is so much waste of material and resources all around which can be stopped, provided one has a technology attitude and the courage to fight the system to implement the required change.

Two trivial examples come to mind. A traveller by road in India sees on the outskirts of major cities thousands of vacant plots of land fenced with brick wall. There is nothing on those plots, not even green grass. If all these bricks and mortar were used in the cities, they would provide enough material to build homes for the pavement dwellers in the cities. A friend argued that these fences are needed to keep the cattle out and mark boundaries. To begin with, there is hardly any grass for grazing. And if there is, there is also a big hole in the wall made by the cattle owners to permit the cattle to go in and out.

Similarly, in many cities I see thousands of metal fences to protect small trees on roadsides. Thousands of tonnes of steel and millions of dollars would have been spent on the exercise. I agree that preserving trees is a laudable objective. But I am yet to see a tree of significant size protected. This waste of steel ultimately boils down to the lack of a grazing policy.

Today, more than ever before, developing nations are in dire need of technology to increase productivity . Because of the population pressure, they have to take to mass production and mass merchandizing with more and more innovations to use less and less resources. But these technologies are in the hands of Western nations, who today are trying very hard to block their coming to the market. They want to build more legal fences and cover up loopholes to protect intellectual property through patents, copyrights, trade marks, etc. Pirated copyright material, including books, computers, software, hardware, films, cassette tapes, as well as watches and other high-tech consumer items eat into their lucrative profits and markets for expensive brand names and signature products. They know that piracy is alive and widespread in Asia and in many developing nations.

The struggle at the international level to protect the ever-increasing and complex intellectual properties is in recognition of the fact that a 'soft war' can be fought only by protecting knowledge, ideas and innovations. Developing nations are subjected to powerful pressures from the Western nations to respect their copyrights, patents and other instruments. Recalcitrance is answered with threats of severe trade sanctions. The matter of intellectual property rights will be the biggest cause for tension related to technological activities between the North and the South, during the next decade.

Human Resource

Most developing nations have a potential human resource in abundance. If not harnessed, it can prove to be a population time-bomb ticking away to blow up all developmental gains of this century. If harnessed well, it can be the most significant asset in the knowledge-intensive service society of the next century. The populations in developing nations are young and still growing, while in ad-

vanced nations, they are old, ageing and decreasing. Many large developing nations like India, China and others have the advantage of numbers. With their populations reaching the one billion mark, they are bound to have several million people with exceptional brain power.

Developing nations are still to realize the importance of human resource development (HRD) whereas all advanced nations and multinational companies recognize the importance of modern training and HRD. They spend millions of dollars to retool their industries, and simultaneously retrain their people, to cope with changes in the work-place. In the modern world HRD requires an advanced technology with interactive capabilities to train people in key positions.

HRD relates to building up persons who would in turn work for building the nation. The key to harnessing this asset is to expedite development for the masses. Development of the human resource requires a minimum level of national literacy and a large amount of vocational training for a variety of routine jobs. It has been proven beyond doubt that female literacy has a considerable impact on family planning and family welfare. Literacy also has links with modernization and development.

It is a sad commentary that in developing nations, it is difficult to find trained carpenters, electricians, plumbers etc. There are no training facilities for these jobs. At the same time, unemployment is increasing. This mismatch is the result of lack of proper planning and implementation.

When we moved to India, in 1986, we had a very difficult time with the carpenters and the electricians in Delhi. It took almost six months to complete the concealed wiring in our house. First, no one had properly calculated the load. Instead of copper wire, the electrician had used aluminium wire. Fire broke out thrice, before I personally got involved in analysing the required load and circuit breakers. The electrician who came to wire the fans and switches was puzzled by my demand that there had to be a sequence in wiring the lights and fans. He was used to wiring any switch to any light or fan. My demand that he should connect the first switch on the panel to the first light and the second switch to the second light was an unusual demand for him.

Similarly, one evening, I saw a carpenter drilling a hole of one inch diameter in the wall. Thereafter he put in a wooden wedge. I assumed that he was hanging the heavy mirror that we had. Next time I went around, I saw he was just about to hammer in a screw. I almost yelled, 'Please stop it.' To see someone hammer in a screw was more than I could stand: I expected him to use a screw driver. I asked him, 'What are you up to?' He showed a 5"x6" painting and said, 'I have been asked to hang this.' This, indeed, was funny. I shouted in fury, 'Do you realize that with the hole you have drilled you can hang yourself? Can't you think that you don't have to drill such a big hole for a small painting like this?' He said apologetically, 'This is the only drill-bit I have.' It was obvious that I was not getting anywhere. Thereafter, I had to get to work to hang about 16 paintings myself.

No one had ever told this carpenter, who had been practising his trade for

over ten years, that he should never hammer in a screw, that there is some relationship between the size of the hole and the weight of the object to be hung. He used the same tools, including a drill that perhaps his great grandfather used. He carried his tools in the same kind of cloth bag that I had seen in villages 30 years ago. Nothing seemed to have changed for him, not even his tool box, leave alone his training.

In many developing nations, technology does not touch the common man's thinking in any way. The scientific temper is missing in villages and in lower level jobs. Science itself seems to have been broken into a Brahminical science—elitist, urban, meant for international conferences and high-level state-of-the-art studies—and a Shudra science—the technology for the worker, which makes things happen. It is Shudra science that will bring about pervasive technology application and bring technology to the masses. This science does not get much attention because it is related to field work. It is because of this division that the carpenter does not have his modern tool box and has not received the required training.

Unfortunately, in developing nations, when someone gets educated and trained, he desires to leave his roots in the village and move on to a more affluent urban life. If he does well in the city, he wants to move on to metropolitan areas for even bigger and better opportunities and infrastructure. The affluent in metro cities start developing linkages with people abroad, and many ultimately leave the country when the opportunity arrives.

Many developing nations lose a great deal of brain power to the developed nations where ample opportunities exist for highly skilled manpower. In the United States, over 25 per cent of the work force engaged in technology-oriented activities comes from West Asia. There are over 800,000 people of Indian origin in the US, with one of the highest income potentials in key positions in engineering, medicine and other professional fields. It is estimated that India has lost around $15 billion to advanced nations through brain drain. By the year 2000 this position will get even worse.

Brain drain from Asia is prominently visible in the United States. Almost all the major universities and corporations there have people of Asian origin in their laboratories. Many major hospitals heavily depend on doctors from Asian nations who are now in key positions. A recent study indicated that from the Indian Institute of Technology, one of the top five technical institutions in the country, almost 60 per cent of the graduates in computer science and electronics leave for the USA. Almost 35 per cent of the chemical engineers also leave for better opportunities abroad.

At one of the premier management institutes in India, I was surprised to learn that of the 120 graduating MBAs, almost 30 per cent were planning to go abroad, and another 40 per cent were going to work for multinationals engaged in the manufacture of soaps, cosmetics and other items within the country. A few were joining foreign banks. Only 15 per cent had plans to work for Indian manufacturing businesses.

Before talking about the brain drain, however, the key question to ask is: Are these nations using the brains they already have? The first task is to develop a brain bank, provide it all necessary support, and use it extensively. Only then it may make sense to worry about the brain drain. It is only after creating conditions for them to come back that one can think of a brain gain and a brain chain across the world to harness the human talent. If bright young engineers and scientists are confined to evaluating tender documents and reviewing product brochures of multinational companies, as often happens, they are bound to seek better opportunities abroad that will give them job satisfaction.

In spite of the expensive brain drain, some administrations in developing nations hardly appreciate the value of brain gain. The returning expatriate experts are seen more as intruders into the bureaucratic system of perks and privileges. People are jealous of their affluence and accomplishments. Many multinationals have recently deputed local expatriates to their nations of birth as executives and agents to build businesses. Even they find serious problems of re-entry and assimilation. In spite of their experience, expertise and enthusiasm they have not been very successful in the traditional work environment with old work methods and systems. However, the smaller developing nations, specially in the Far East, have been reasonably successful, in the last decade, in building the local machinery to attract foreign investments and talent to create a large export potential and local employment in high technology areas.

For example, more than 20,000 Taiwanese now studying in American universities and even a larger number working in industries, are choosing to return home. Taiwan's rapidly improving living standards and growing business potential makes it attractive for them to return. Chen Shen, President of the National Taiwan University, says, 'Our human capital in the United States is a tremendous asset. We are going to start drawing on the principal and the interest.'

The returning expatriates bring with them enthusiasm, innovation, entrepreneurial management and drive to harness their technology, management, education and experience. They belong to the 'ME' generation, and not the 'WE' generation of the old hierarchical system where one's identity has to be given up. They are bringing new opportunities, new investments and a new lifestyle. They have learned to do things their own way. They are determined to follow their instinct and create a more open management system to which they have been used in the United States. Because they bring along far reaching forces for change from abroad their talent and expertise are highly valued in the marketplace. They also bring foreign money freely into their country's booming stock markets. This has helped change the attitude of traditional financial managers and decision makers in the country. Partly because of the push from this new breed of expatriate managers, antiquated banking regulations and investment practices have been streamlined and in some cases cast aside.

Such expatriates are one of the biggest assets developing nations have. They bring in fresh thinking, infectious enthusiasm, new technology, new way of

doing things, and a view from the distance which is detached, clear and more objective. Many new initiatives have been taken in the past by expatriates all over the world. Even Gandhi, who spearheaded the movement to dislodge the British not only from the Indian subcontinent but also from Africa and other parts of the world, was an expatriate.

These experts of Asian and African origin in the advanced nations could be an asset even for the Soviet nationalities and East European nations. Socialist nations may do well to recognize the potential of this pool of talent and use it effectively to balance an equation with the mosaic world. The Japanese would not necessarily be part of this mosaic world since they have ceased to be truly Asiatic, and have become quasi-white.

The expatriates will some day recognize the value of finding roots and come home to developing nations to help as new missionaries. Even their children, born more affluent than their parents, may turn their attention to their roots and cause a revolution of the kind that the white missionaries did centuries ago. They may bring a new meaning to the message of modernization in many developing nations, and generate unprecedented growth and prosperity. They are the true explorers to watch for.

If leaders in developing nations do not wake up to this and other realities, and if they do not change and adopt some radical economic reforms, they will be left behind with a primitive production base and obsolete technology and products. It is believed that the developments in the erstwhile Eastern bloc, with enthusiastic support from the Western nations, will fuel Perestroika and Glasnost in many developing nations as well. In these nations also ideologies and dogmas will give way to liberalized free markets, along with democracy and discipline.

It is to be hoped that developing nations will also learn from the peace initiative of the superpowers and divert part of their defence expenditure to the social sector. The silver lining in all this awakening, alliances and conflicts is the opportunity for awakening among developing nations. Those of them which have hitherto benefited from the support of and funds from the international communities and Western allies will now realize the need for standing on their own feet. They will learn to develop alternative plans to attract and update their technology and improve their resource base for meeting their people's basic human needs through modernization.

9. New World: The Hope

In the past decade, the world society was witness to the emergence of new social and political forces driven by developments in technology. The demands for democracy and freedom all around the world shaped human destiny. The era of dictators and kings was ending. The common man today is conscious of developments qualitatively different from those of the preceding decade. The current patterns of events do not resemble those of 1914 or 1939, with memories of fear, insecurity and, most importantly, the death wish which now belong to the past. The old patterns not only divided the world ideologically, but also the human mind. The fragmented existence was full of conflict, pain and paradox. The new forces have liberated human consciousness from the ideological boxes. The trauma is over.

In present conditions, the global social systems work as a world system, in which communication is universal, transportation supersonic, and information instantaneous. Interdependence among nations and continents has become a law of the world. For the first time, we can speak of a global community and global interactions. Information, money, physical objects, people or other tangible items move across state boundaries, freely and frequently. Events in Eastern Europe affect developments in Nepal and Burma. Peace is indivisible now.

The revolution in communication, information and transportation technology is the watershed in the creation of a global system encompassing the whole planet. Technology is creating more and more integration at the world level. Communist societies have started adopting the new technologies which demand not only flexibility in their age-old rigid social and economic systems but also a change in their peoples' general outlook. Societies, whether capitalist or socialist, need technology for their very survival, as well as for their advance. The fear of lagging behind in the technological race compels nations to cooperate and realign. Technology has never been neutral in its concepts. It shapes and reshapes ideas, cultures and world views. It destroys, but at the same time, it liberates.

Modern Western technologies cannot be adopted and applied in isolation. They bring along with them a certain amount of Western thinking and culture related to management, innovation, entrepreneurship and democratization. They also emphasize productivity, efficiency, networking of markets and globalization of resources. Some of these values and virtues are labelled Western only because they have originated and developed in the West. Modernization and de-

velopment anywhere is unthinkable without these values.

In many nations, the mind-set is still traditional, rural, agricultural and, at times, counterproductive to growth, equity and prosperity. The time has come for them to re-examine their attitudes and strategies vis- a-vis global thinking and the global phenomenon of development. Not only have the rules of the global game changed, the game itself has changed, in the wake of Gorbachov and his Perestroika. While the rest of the world is playing cricket, developing nations cannot afford to play kabaddi (a traditional Indian game which does not require any gadgets such as ball, bat, pad, stumps, etc.). Nor can they bury their heads in the sand and say, 'This game is not for us, it is only for the rich.' They should rather ask: 'How can developing nations of the South contribute and modulate the modernization and globalization processes in the North?' 'How can they, with their powerful large bloc, inner strength and vast knowledge and experience, modify the rules of the new game to benefit themselves and the world at large?' This is the prerequisite for prosperity in the new world.

In this interdependent world everyone will be forced to play, if not the same, perhaps a similar game. If the present generation does not wake up to the hard realities of the race, the next generation of young doers, who are more Western and global in their outlook, will force it to happen.

Socialist values, which led to subsidizing everything from education, health, housing, food to transport, have given people too many free lunches and, in the process, killed initiative. They have led to a one-way street where citizens expect the maximum subsidy from government without giving anything in return. Many have got used to sucking the governmental programmes for undue perks and privileges. Political systems also have encouraged this in the name of democratization and development for the poor. Everyone asks: 'What is in it for me? How do I get away with more than my due share?' The burden of this on many governments has been near-disastrous.

Today, even in developing nations a majority of people are willing to pay fair prices for the products and services they use. Even the poorest do not like subsidies. They feel humiliated, insulted and hurt when treated as ignorant, helpless creatures incapable of taking care of themselves and always looking to the state for survival. They want fair wages, equality, respect and dignity in their labour. However, how do a people get out of the trap of heavy subsidies once it has been set? It requires a bold initiative. Perhaps, this is the opportunity of the decade to initiate reforms to encourage people's participation, privatization, fair market values, competitiveness and globalization.

The new world offers hope for everyone. For the advanced nations, it is the victory of capitalism. For the socialist nations, it is an opportunity to restructure after 40 years of Cold War, and adopt modern management and technology needed to improve the standards of living with the freedom and flexibility of a democratic society. For developing nations it is a challenge to demand their fair share and avoid isolation and alienation, to make sure that the tension between the North and the South does not delay development.

The new world is positioned to bring hope of peace and prosperity, cleaner environment, increased dominance of technology and technocrats, new developments and breakthroughs in the field of health, transport, electronics, communication, robotics, biotechnology and the possibility of a world government with fainting and, in some cases, disappearing borders with free movement of goods, services and people, ultimately leading to world citizenship—at least for the technocrats of the world.

Nysbit, in his 'Mega Trends' outlines forces which will shape the future of the world. These relate to movement from capital-intensive industrial base to knowledge-intensive information base, forced technology to high-tech, national economy to world economy, short-term to long-term interests, centralized to decentralized administration, institutional to self-help programmes, representative to participative democracy, hierarchical to networking relationships and rather than either-or choices, multiple choices in problem-solving.

The vision of the future in the technology driven new world cannot be based on what seems possible: it needs to be decided according to what *has* to be made possible. Technology will have to be mobilized to make the essentials possible—and that is the challenge for the new world.

Peace and Prosperity

The recent explosion in freedom and realignment of the Eastern socialist and the Western capitalist nations makes it clear that the world is becoming a better place to live in with a potential for peace and prosperity. With the voluntary destruction of warheads, the Cold War has ended, making the world safer and more secure. Because of the sudden expansion in communication technology, the world is moving closer together, shortening distances and cutting across boundaries. At the same time, the growing disparities between the South and the North are pulling the world further apart.

Technology is the key driver in integrating and assimilating the aspirations and expectations of a large number of people the world over. Because of these modern Western technologies, the Western civilization is spreading throughout the globe. No longer is it 'East is East and West is West and never the twain shall meet'. More probably, it will be 'North is North and South is South and never the twain shall meet.'

People used to be divided on grounds of differences in cultures and religions. The cause of division now is economic disparities. The affluent nations are coming increasingly closer to one another, forcing realignment the world over. There is concern about poverty throughout the world, but no clear action plan on removing it. Many who advocate solidarity of the affluent nations feel that they have little need for the poor nations. There is very little they need from the poor nations which would require solidarity with them. Within their trading bloc they can find substitutes for whatever little raw material is left in the nations of the South. They do not need it any more. Most of the raw material is now being

replaced by synthetic products. They also no longer need nations of the South for military bases to fight their enemies.

Notwithstanding the conflict between the rich of the North and the poor of the South and between economy and ecology, the interdependence of the world is here to stay. All eyes are firmly fixed on globalization and industrialization in quick tempo. Everyone is committed to improving the standards of living. Everyone is looking to the North for industrialization and the modern life-style. To the North, the market in the countries of the South should be attractive because it is large enough to absorb all the goods produced in the world market. To make this a reality, however, the purchasing power of the masses in the countries of the South needs to be substantially increased.

The prospects for peace and prosperity are higher now because of the many fundamental changes taking place the world over. To begin with, there is a growing consensus on democracy and democratic norms which emphasizes on power to the people and participation by all. Democracy is no longer dismissed as a luxury of the rich and the affluent. Whether in the socialist or developing nations, real people's democracy is on the ascendant as opposed to the democracy of the elite and the intellectuals. In Eastern Europe, people achieved democracy by taking their aspirations, expectations, struggles and movements to the streets.

It is to be hoped that democracy will bring concern for the rural poor, the minorities, and for the women and children the world over. Democracy is also expected to bring freedom of expression, freedom of speech and freedom of movement, which have been restricted for many decades. This new democratic experience will result in further cooperation as opposed to confrontation.

Cooperation will come also from a concern for common human values related to human rights, ecology, environment, elimination of poverty and improvement of standards of living. In this process, voluntary agencies and independent institutions will play an important role.

The best way to ensure peace is to make life comfortable for the world's majority. To a large extent, this has been achieved. Before the world wars, comfort was a privilege for a few affluent people in high society. Now we have reached a minimum critical mass for the comfort level, such that it does not pay to fight any more. In the present consumer-oriented culture, people want jobs, money, exposure, entertainment, products and services. They are least concerned about conflict and confrontation. They are part of the new 'ME' generation that is concerned only about personal freedom and personal prosperity and is least bothered about wars and victories. The new awakening offers a great hope for a free, fair and flexible world, full of enjoyable opportunities to travel, entertain and explore.

The world leaders now know that with modern electronics warfare and expensive warheads no one can win wars. In Vietnam it was proved that no amount of technology and modern machine-guns can assure victory. Modern wars are expensive and inconclusive. They go on for a long time and ruin the

local economy and prospects for prosperity. Enough has been learned in the past 40 years that war-based economy is prohibitively expensive and does not sustain national development and growth for long.

Gorbachov openly admitted that for humanity it is more important to build consumer products to increase human comforts, than to build machine-guns. People want to produce more bread and butter than more bullets. Gorbachov's initiative de-escalated the arms race and systematically reduced war-related hardware. He transformed the system of secrets and security to win the people's trust and confidence in moving towards a new economic order. Following these strong signals and commitments to democracy and openness in the Soviet Union, all nations of Eastern Europe also moved towards democratic values and free enterprise system. With this, the confidence in peace and prosperity was further strengthened. The world has been monitoring these developments in Europe with great hope.

The elite of the South consider Europe as an excellent role model. They have been fascinated by the way the EEC is taking concrete shape by end-1992, and the explosion of freedom in Eastern Europe. Being used to taking signals and directions from Europeans since the colonial times, they are looking at the strategies and alternatives being adopted in Europe as possible answers to their problems. They perhaps feel comfortable about the new developments in Europe. The nations of Europe, on their part, are looking to the US and Japan for programmes of prosperity.

Environment

There is one element that binds all of us together, irrespective of where we are and what we are, and that is the air we breathe. To survive, we need to breathe in fresh clean air. Environment is a common heritage of mankind and, consequently, its common concern.

In the last two decades, our environment has been substantially damaged and destroyed because of the prevailing emphasis on economic growth. The strain put on water, air and soil, because of the continuous emphasis on industrialization without concern for environment, has undermined the life support system. In many parts of the world, jungles have been erased, desert areas are growing, and the air is saturated with chemical pollutants.

Environment seems to be man's greatest concern for the future. Everyone recognizes that environment is under threat. People know that flood and drought are a consequence of deforestation, poisoning of air is a result of heavy industry and chemical plants, and poisoning of soil comes from over-fertilization with chemicals. Often, knowledge is far ahead of action. We know what needs to be done but we have not yet organized management and information system to achieve visible results.

Environmental protection has become a major movement the world over. Many activists have made it a lifetime mission. All over the world, there are

major movements to clean the world's environment by growing more forests, controlling chemical pollution and creating public awareness. Governments the world over are also working towards creating better laws and an institutional framework for a cleaner environment. Interdependence in environment is far greater than interdependence in economy, business and trade. However, the emphasis on this is only recent. It has only recently been recognized and appreciated that the coexistence of man and nature is a matter of survival for the rich and the poor.

The cleaning of environment will call for a cultural change in our consumption pattern and approach. Some insist that materialism and consumerism are the root cause of environmental problems. Others have great faith in man's ability to solve problems, even those related to environment. Man's genius indeed is greater than all problems put together. For any problem, there will always be a man with a mission to solve it. This faith is the faith in technology and its relationship to man's ability to solve problems.

It is wrong to assume that we are at the end of our tether with nothing more to expect from the earth. Indeed, the earth has a great deal of resources which we have yet to explore. For millions of years we have been merely scratching the surface. The vast ocean with its wealth of riches is yet to be explored. When we talk of lack of adequate drinking water supplies, for example, we forget that in some places there are periodic floods but we do not have the proper technology to store the water. Thus all the rain water resources go down to the ocean, carrying along the rich soil to aggravate the problems. To many of these problems there are solutions, if we are willing to accept the challenge, and mobilize technology for environmental protection, preservation and prosperity.

Technology Power

Technology is a productive power which has been used both for development and destruction. In the modern world, technology has become so pervasive that in an average Western home 20 motors may be running at a time, in fans, hair dryers, garage doors, washers, mixers and other appliances and gadgets. Technology has an impact on individuals and institutions. It is affecting our lifestyle, customs, cultures and national and international politics.

Though technology has become a powerful tool for productivity and prosperity, to many it still remains a mystery. There are those who are afraid of technology, partly because of ignorance. There are those who condemn it. Some politicians downgrade technology, while others extol it. While it is fashionable to talk about technology and its consequences, many who talk about it hardly understand the intricacy of technology and the trade-offs.

Economics is analysis, social science is observation and politics is power, while technology is work—progressive and creative work for problem-solving. When President John Kennedy gave a call to place a man on the moon by the end of the decade, thousands of engineers and scientists all over America

worked very hard for a decade to make his dream a reality. As a politician, all he could do was to give a call and challenge the system. Technology then had to be mobilized to translate his call to reason, reality and results.

Similarly, Perestroika has no chance of succeeding without the technocrats coming together to help develop tools and techniques necessary to create products and services for the Soviet citizens and the competitive world markets. Perestroika is a leader's dream and vision, which can only be developed by the power of technology, to deliver what people want.

All future leaders will need to recognize the contribution of technology. If they are serious about fulfilling their promises, they cannot do it without forming stronger partnerships with the scientists and engineers. To be effective and useful to their constituency and community, the leaders of tomorrow will have to learn more about technology applications, options, benefits, costs, trends, alternatives, etc.

The world is already moving towards the politics of technology and trade. All major world issues today centre on technology which drives the engine of development, economy and employment. As the years go by, more and more national and international issues will be affected and dictated by technology. Technology thus will change the nature of future politics and politicians.

In the first quarter of the next century, two technologies will play a critical role in reshaping the world. They will bring innovations in a variety of fields affecting human needs such as health, environment, comfort, entertainment, communication, food, etcetera. These technologies are: electronics, which already has a well-established large industrial base, and biotechnology, which is an upcoming technology with promising prospects.

Electronics, an invention of this century, received an impetus from the invention of the transistor during the late 1940s. This changed the entire concept of reliability, performance, cost and possible miniaturization to bring electronic applications to almost everything. Today, electronics pervades information technologies with communication, computers, networks et al., control technologies with robotics, automation, artificial intelligence, instrumentation, energy management, entertainment and other applications at home and in business. With very large scale integration (VLSI), application-oriented special integrated circuits (ASIC), sub-micron technologies on silicon and new materials like gallium arsenide, sophisticated, cost effective, fast microchips will now become pervasive in education, health, transport, leisure and many other areas.

Electronics applications will make communication universal, instantaneous and inexpensive. They will enhance accessibility and integrate voice, data and video to offer flexibility. Supercomputers will be available on the desktop by the beginning of the next century. They will have memory devices as small as a postage stamp to store millions of pages of written documents.

Robotics will be common on the factory floor. They may even be found in homes, performing routine, cleaning and cooking duties. In the next ten to 20 years, we will encounter robots at the fast food restaurants, cooking hamburgers

and taking orders. Airport and shopping centres then will be cleaned by mopping robots.

In the near future, mechanical robots will take over many of the cumbersome, repetitive and difficult jobs from human beings. The latter will, thereafter, be engaged only in manipulating these machines and move on to other lighter and intellectually challenging tasks. For the production of steel, for example, no human being will need to stand in front of the hot furnaces. The movement of molten steel, hundreds of degrees Celsius hot, will be managed entirely by the machine intelligent robots.

Greater automation would call for more information. In other words, large computers will be needed to handle a large amount of data. The trend today is to move towards a parallel computer architecture where multiple tasks are handled in parallel by a large number of machines simultaneously, the task being partitioned into smaller pieces of work for the individual processors to handle independently. This technology will change the nature of software and demand new modelling techniques. Electronics will be required also for sensing and control in automation and robotics through detection, identification and tracking. The required innovations for sensing and vision will come by means of electronic magneto energy, infra-red, ultrasonic, or X-rays.

It is also feasible in the next 50 years to develop a solar paint. Household rooftops, painted with this invention and connected with two leads to the electricity supply line, will generate enough electricity through solar power to meet the needs of the household. Motor cars painted with solar paint on top will generate enough power for locomotion. A window glass has been developed with electronically controlled liquid crystal displays to turn it into a glass with built in venetian blinds. New electronics will also supply flat-screen TVs that will be hung in living rooms like a painting, and a cordless telephone in the wrist watch. The future also promises a voice-activated typewriter with built-in text processor.

Fibre optics also may revolutionize communication, computer surveillance and controls. Fibre optics will become available in every home as a normal telephone wiring. They will then be able to receive high resolution graphics and high band width pictures. Super conductors offer yet another exciting opportunity. With the right kind of super conductors, at normal room temperatures it will be possible to have unlimited band width without any energy loss for unlimited power transmission. It will also have unlimited applications for transportation, particularly for mass transportation in urban and metropolitan areas.

Biotechnology will have a major impact on agriculture, health, environment, process industry and pharmaceuticals. By manipulating genes, biotechnology will be able to create living organisms to perform the desired task. The first genetically engineered micro-organism to receive a patent award was developed by an Indian-born scientist at the General Electric in the US. This engineered bug was designed to eat oil spills by multiplying itself and thereafter integrate into natural elements. Because it had ethical implications, the patent case for

this organism was settled at the Supreme Court level in the US.

It is said that with biotechnology, internal organ growth will be practicable to avoid organ transplant. Also, new drugs are being engineered to dissolve blood clots to avoid surgery. Similarly, new drugs are available to grow a dwarf into a giant basketball player. It may also be possible to grow a part of the body lost in an accident by breaking the genetic code. Biotechnology may also make it possible to extend the human life-span to 150 years. It is possible to understand and intervene in the ageing process. Scientists are also experimenting with re-engineering human beings. Some believe that the human machine is very inefficient. We use very little of the food that we eat and create a lot of human waste. It may be feasible to survive by eating one properly engineered pill a day. This will give a whole new dimension to waste management because with a pill a day no human waste may be created at all. Some visionaries also believe that it may be feasible to develop a drug which can be given to a newborn child to form a special lining in the stomach, such that anything eaten can be converted into the right amount of protein. This will change the concept of hunger, poverty and health.

Biotechnologists are also working on refining oil underground to save costs. They believe that today's system of moving oil through pipelines to a distant refinery is no longer cost-effective. They are looking for chemical solutions which, when dropped into the oil well, will immediately start the internal refining process underground.

Biotechnology will have implications also on energy and ecology. Scientists are talking about planting trees which will grow at the rate of one foot per day. By planting such a tree in the backyard, it is feasible to have a power plant for every household, eliminating the need to distribute power which is so expensive today. They are dreaming of replenishing rapidly the green cover that we have destroyed in the past 50 years. Biotechnology will also be used to clean dirty ponds, desalinate sea water economically to make it potable and create vegetables and fruits that are not known today. It is now possible to develop a combination of tomato and potato, carrot and banana. With gene splicing it is possible to produce carrots and celery that can remain crisp longer than conventional vegetables. Tomatoes that will stop ripening the moment they are harvested are being tried out as also fish that will grow faster and larger while eating less. One young scientist in South India has invented a technique by which through a thermal shock of a specified degree given to a baby fish for a specific time-frame, it is possible to grow double the amount of meat on the same fish bones. A variety of techniques are already available for better shrimp farming. Other possibilities are changing our animal population with healthy and more productive cows and buffaloes, and some fanciful possibilities like engineering of new animals with a combination of dog and cat. Low cholesterol eggs, pork and other dairy products are also being worked on.

Similarly, there is a lot of interesting work under way in many other important areas of science and technology related to space, materials, transport, energy

and health. For example, in the next couple of decades it will be possible to travel commercially across the globe in two to three hours. There are some unique possibilities with remote sensing, using satellites for water management, agriculture, land management and other large developmental programmes.

Technology in the next few decades will give a new direction, new solutions and new hope to millions. If one can grow vegetables and food crops faster, better and bigger, hunger may no longer be an issue in this world. If we can increase rapidly the green cover substantially, and clean our rivers and reduce the human waste, ecology may no longer be an issue. If we can provide communication to everyone at a lower cost, with greater accessibility, ignorance may no longer be an issue and networking people and information may become practical and profitable.

The Next 50 Years

Based on Perestroika in the Soviet nationalities and the recent awakening in Eastern Europe, coupled with overwhelming support from the Western world, the next 50 years are bound to be encouraging and exciting. The globalization of technology and markets will have an immediate impact on technology applications and utilization in the socialist world, affecting the lives of millions there. This will further fuel growth in technology and strengthen the process of modernization and industrialization the world over. Based on the role of electronics and biotechnology, coupled with the new alignment of the socialist and capitalist world, two sets of trends will emerge: one, technology having direct bearing on products and services; and two, a general trend in which technology has indirect implications on world politics and development.

Technology trends would have ten dimensions, as follows:

First, the trend towards miniaturization. The new technologies will move towards miniaturization of products of all types. This will be incorporated with sub-micron microelectronics and micromachining. These products will include micro cameras, television, tape recorders, scanners, controls, radio, telephones and many others with greater capacity to combine the new functions and features. Through micro miniaturization it will be possible to mass produce products with precision, automation and with minimum raw materials. This will save a great deal of world resources in packaging, storing and distribution. These micro products of the future will provide better performance than their present counterparts at lower cost and lower power.

Second, the scope for increased productivity and efficiency. The new technologies will increase productivity and efficiency at all levels in an organization to manage scarce resources and eliminate waste. The future system will be designed to do things right for the first time to reduce scrap and save time and energy. Many new productivity tools will be developed to overhaul the present discipline. These tools will require information, communication, computer, controls, robotics and many new technologies. They will also require change in the

work attitude and environment.

Third, the focus on cost reduction. The new technologies will focus on continuing cost reduction and increasing product affordability. All those who specialize in value engineering a product will extend the life cycle of a product through cost reduction. By keeping costs low some of these new products and services will find applications in the lower middle class homes and in developing nations. Cost-effective technology will make it possible to reach masses and solve problems related to basic human needs.

Fourth, substitution of materials. In the next 50 years, many new materials will be invented to substitute the present natural resources with greater strength, lower weight and increased durability. Many new synthetic materials will find use in agriculture, food, furniture and factories. Some of the new materials will be produced through recycling of waste. All this will reduce the pressure on the ecosystem to support the present pace of development and sustain the ever increasing population.

Fifth, standardization. In the future, more and more attention will have to be given by the world community to implement standards for performance, interface and safety. This is one area where technocrats will have to work together to benefit customers. Globalization of markets will need global standards.

Sixth, the necessity for time management. Time management will be the biggest challenge for all who are engaged in business and administration. In a knowledge-intensive environment, time will become a precious commodity. Many in the advanced nations will find that they will have every luxury at their disposal but not the time to enjoy it. Keeping pace with increasing specialization and ever-growing knowledge will demand considerable time from individuals and experts. Time management will become a major preoccupation of the future professionals, managers, leaders and others.

Seventh, increased comforts. The new technology will further increase comfort for millions. It will make life softer for many with new jobs, new tools and new products. Human comfort will be one of the key market areas to focus in the next few decades. As income levels increase, the comfort level will also increase simultaneously. This will change the nature of work at home and also in offices. Many will work from home with sophisticated information tools. For others, routine home tasks will be pre-programmed for robots to handle. This will leave more time for leisure. People will reduce the number of working hours and thus there will be more leisure and comfort.

Eighth, the growth in leisure industry. The leisure industry is already a multibillion dollar enterprise. It will grow manifold and create millions of new jobs. Leisure will lead to luxury. What seems to be a luxury today may become a necessity in a few decades. The telephone or a car, which was a luxury not too long ago, is now a necessity for almost everyone in the Western world. These products will also become a part of basic necessities in developing nations in the future.

Ninth, the increase in automation. Technology will increase automation sub-

stantially. Automation will take over almost all the routine pre- programmed tasks, specially hard tasks, from human beings. People will then find more time for knowledge and action. Automation will be common at home, work-place, banks, railway stations, airports, hospitals, etc. People will be required only to assist and inform. With a voice-activated typewriter and a voice mail box, for example, all routine forms will be filled verbally and electronically for easy access and retrieval.

Tenth, the pervasiveness of technology. The essence of these technology trends related to miniaturization, productivity, cost reduction, standards, and automation will make many technologies pervasive. People will learn to live with high-tech and feel comfortable with new products and services of the future. This will enhance availability with mass merchandizing and mass distribution. As more people feel comfortable with new technology, more technology will be sold. As more technology is sold, more people will learn to live in a new environment and adjust to a new thinking. This will have an indirect impact on development and politics.

Technology also has indirect bearing on world politics and development. Because of technological developments, there is a fundamental change in people's perception the world over. People are realizing that the world's political weather has changed in the last decade because of communication and consumer technologies. Government control is now seen as a problem and not a solution. People's participation and privatization are being encouraged everywhere. They are now prepared to define afresh the role of government and solve their problems locally with a sense of the new community values. The events in Eastern Europe have convinced them that it is time to look for new ideas and move beyond narrow interests to global interests. Everyone is accepting, encouraging and enjoying democracy and liberalization. It is recognized that without releasing the energies of free enterprise and free market, necessary goods and services cannot be provided to satisfy people's aspirations.

People are positioning for the next century when new activism and social change through globalization will become the realities. They are looking for new ways to engage government, business and labour in projects to solve problems and help expedite development. This movement is gaining momentum all over the world.

Forces of market, incentives and entrepreneurship have now gone far beyond the US and the Western world and are active in the socialist and developing nations. People are beginning to recognize that government is not capable of solving all the problems and they have to solve their own problems. This can be done only by local initiatives and local skills. Many are now looking at self-interest with public purposes in mind.

In the next 50 years, the world will be covered throughout with the democratic spread. The demand for democratization has already started in Africa. Having tasted and accepted the power of democracy, people want their voice to be heard no matter where they are. Dictatorial systems, a legacy of the past, will

crumble to give power to the people.

Simultaneously, Westernization will increase all over the world. The concept of modernization, industrialization, democratization and Westernization will be integrated to promote Western culture in Africa, Asia, South America and other parts of the world. Western influence will be seen in the popularity of the English language, music, dresses, products, services, entertainment, etcetera. Even food habits will be affected, besides the thought process. All modern metropolitan cities of the world will promote Westernization and urbanization will automatically come to be linked with Westernization. In traditional societies, Westernization will take roots through the modern media and consumer products. These societies, in the next 50 years, will have very little of their own culture left in the form of art, craft, song and dance. They will almost be like tribal cultures, found only in isolated pockets and remote corners. Everyone in traditional societies will be looking forward to the good life provided by Western technology and products without really being aware that these will also bring along with them Western values and Western life-style. Through Westernization the world will be integrated faster into one monolithic world community.

Globalization will be further enhanced, because of miniaturized products, lower communication costs, faster jet travel and networking of knowledge and resources. Globalization will spread to all developing nations as well. It will also include financial services without the present foreign exchange controls. The future world will have, within less than 50 years, a free flow of financial instruments with convertibility everywhere.

The world community will also realize that national development cannot be smooth without de-governmentalization and de-bureaucratization. Private initiative in building trade, business, technology, distribution, marketing and even infrastructures will be encouraged everywhere. This will increase the flow of products and services and bring about a vibrant economy and an entrepreneurial drive to work for improving the standard of living for everyone.

In a technology driven world, individualism will increase. People will worry more about their own problems and prosperity. The 'ME' generation will flourish with pride in individual initiatives. Large families will break up in favour of small independent families comprising working couples who are concerned mostly about improving their own standards of living. This process of democratization, globalization, Westernization and de-governmentalization will breed a new generation of young individuals who will be more open, more innovative, and self-centred. However, they will be more concerned than the present generation about the community and the environment. They will enjoy their individualism while accepting their own responsibility for the community at large.

These general trends based on technological prosperity will impinge upon issues related to population, literacy and environment. World population will continue to grow from the present five billion to level off at about nine to ten billion, and then begin to decline since there will be large numbers of small educated families with no more than two children per couple. By then, female lite-

racy will have been achieved and infant mortality reduced substantially. Even in rural communities small families will become the norm. By then, modern farming methods, bio-fertilizers and biotechnology will produce enough food for ten billion people with perhaps less resources and less land area.

Because of the process of democratization and individualism, coupled with mass communication, the predicted population explosion will not take place. Perhaps, 200 years from now world population will return to the present level of five billion. It would have been best if we had the population of the 1790s and the technology of 1990s. Unfortunately, world population is out of pace by 200 years with world technology. Perhaps, after the next 200 years population will be in pace with technology.

In the interim, millions may starve and suffer from floods and other natural disasters due to lack of technology and management related to the delivery and distribution system. The population in the Western world is already on the decline. As prosperity increases, population stabilizes or starts declining. This has its own dynamics of creating pockets of an ageing but healthy population. This will create a shortage of young working people to push an economic engine in many nations. One likely result of having ageing and decreasing population in developed nations and increasing young population in developing nations is large-scale migration from the latter to the former. It is estimated that only one per cent of the world population live outside their nation of birth. This may change to five per cent in the next 50 years, with open borders in Europe and other regional alliances.

Technology driven development will also increase world literacy. With new communication technologies, exposure to television and concern of people, the rate of literacy will increase substantially. It is predicted that within the next 50 years, the world would have achieved close to full literacy. This will be one of the greatest achievements for mankind. Having attained full literacy, the enlightened world population will be able to deal with many social and developmental issues effectively.

Health, hygiene and education are related issues. As literacy increases, concern for child development, role of women and environment will also increase substantially. Environment is the only issue which will keep our world community glued together. Within the next 50 years, environment will no longer be an issue. Biotechnology with tissue culture and plant biology will help trees to grow, thus increasing the green cover. Environmental education and awareness will also increase with the modern media methods to help create a concern in the community for a cleaner and safer environment, free of pollution and chemicals. For this, new technologies will be developed and new enterprises created to protect and preserve our common heritage.

While electronics and biotechnology will be busy delivering new products and services, health science will also expand rapidly. With new knowledge of genetics and human engineering, it will be possible to extend life expectancy to 150 years. Increase in life expectancy will have implications on retirement, so-

cial security, working life and many other related issues.

So much for the good news related to the brave new world of technology of tomorrow. While there will be all-round development, however, the disparity between developing nations of the South and the advanced nations of the North will continue in the next 50 years. It will be a major cause for tension and turmoil in the world. Technology, which will be developed to bridge the gap, will also create further distance and disparities. Technology, which should be the only integrating power between North and South, will divide them further. Some technologies, which the South will need badly, will be prevented from crossing over to its borders. At some point in time, however, after achieving a minimum acceptable and respectable standard of living, the advanced nations will have to freely transfer critical technologies for development of the South not for economic but for global considerations. Only then would the world be integrated to guarantee peace, security and prosperity for all.

To create a future based on the promises of the electronic and biotechnology revolution, effective management, entrepreneurship and innovations will have to be developed and deployed. Democratization and globalization will strengthen the innovative process. However, a new work environment will have to be created, to translate these innovative processes into products and services that can be delivered and distributed to people at large. This is the process of creating new wealth for the future world. And this is the challenge before the new world.

World Government

Perestroika has made the vision of a global government with world citizenship feasible. Gorbachov has carved a niche for himself in history as the man who reformed and restructured the socialist order in the Soviet Union; who ended the Cold War; who created a new awakening for new alignments in Eastern Europe leading to reunification of Germany and democratization of socialist Europe. But more than anything else, Gorbachov's place in history is as the man who planted seeds at the tail end of the twentieth century for a global government and world citizenship. At this stage, when the seedling is not yet visible, a global government may sound like a wild dream. But within the next few generations, it will be considered practical and profitable.

If technology provides the kind of prosperity expected in the next century, the world political and social environment will change drastically. No futurologist or political heavyweight ever predicted that the capitalist world would merge with the socialist world so rapidly. It was unthinkable a decade ago, and not visible even two years ago. But, today, it is a reality. There may, similarly, be all the good and valid reasons for disregarding the concept of global government. Yet it must be mentioned as the end product of the recent explosion in freedom.

Already, national borders are disappearing between the US and Canada. Very soon, borders will disappear between the 12 nations of the European Economic

Community. Free and frequent movement of people and goods among nations of Eastern Europe may start in a few years from now. Essentially, this process will eliminate borders between the developed nations of the North and provide a passport for free movement in the North.

In the Far East, the nations of the region are already engaged in a dialogue to ease their trade and technology barriers. They will, no doubt, create a zone of free movement for themselves. This will leave a large number of developing nations of the South with their own internal disputes and conflicts. They will perhaps take much longer to sort out their differences and create trade zones for free movement. Until then the world will have a north zone with free open borders for the white and the south zone with restricted borders for the browns, blacks and yellows. Movement between these two zones will remain restricted to prevent immigration and integration of people in need of technology and development.

All along, those who deal with high technology, regardless of their caste, colour or nationality, will be able to move freely across the globe. They are the citizens of the first world. Their passport is their technology. They are in demand everywhere. They command respect and are provided with resources needed to build new products and services. Good computer software experts are, for example, in demand in all advanced nations of the West. The many barriers to entry and strict immigration regulations are not meant for them.

Global government will emerge only if, by the second half of the next century, living standards in the nations of the South improve substantially. If large disparities continue between North and South, the economic barriers will keep the physical borders secure and safe. Economic development alone can break these physical borders. The Japanese with their economic power have broken the barriers. They are considered honorary white citizens even in South Africa.

The nations of the South will, therefore, have to rise to the occasion along with the socialist nations of Europe. To deliver development to their people, they will need to restructure and realign their economics and development in tune with the global trends for free markets and free enterprise. Only then will the disparities between North and South be narrowed for future integration. If this does not happen, the gap will widen, making the developmental task even more difficult.

Global government will ensure peace, liberty, and prosperity for all world citizens. A mini-model of global government is already being developed in the EEC. Learning from it and in the light of the experience at the United Nations, it is feasible to evolve a loose federal structure, which will encourage free movement without curbing nationalism and personal freedom. Let us hope that the explosion in freedom, triggered by technology, will lead to a further awakening to formulate plans for global concerns and global issues related to development for all world citizens.

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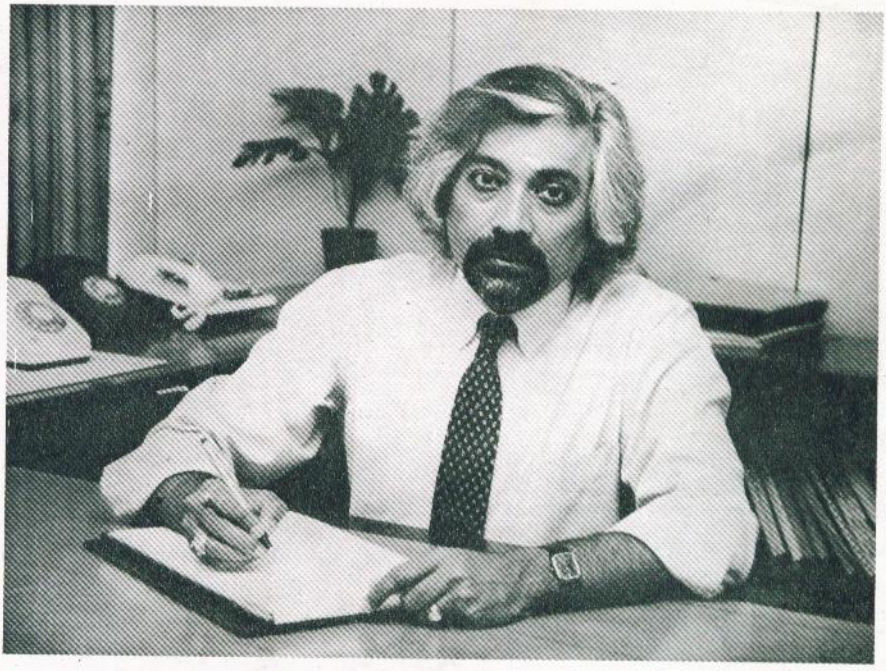

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