Chapter 15
International and Domestic Economic Development

Selecting which of SRI's projects in economic development to describe is, like in all other areas of its diverse endeavor, very difficult. With so many efforts in so many countries, there is simply too much from which to choose. But in a few cases SRI's role was broad enough to affect an entire country with important and lasting changes, even though that contribution was not publicly known. In that regard SRI's projects in India and Saudi Arabia are described. More focused impacts such as governmental roles in telecommunications and intellectual property rights in England and the Philippines, respectively, are also covered. Outcomes of a number of other projects, both international and domestic, are included. Finally, there is the case of Zambia, one of the world's disadvantaged countries, where the repeated efforts of SRI and the World Bank show how enormously difficult it is to ease its pervasive and continuing economic struggle. As with other research areas reported in this book, the selections are often aided by simply finding those principals who are still reachable.

Helping Build India's Middle Class

It was the mid-1950s, less than a decade after India won its independence, when SRI entered into a working relationship with the Ford Foundation and its technical assistance programs in India and Pakistan. That third-party source of funding was the only means SRI had to work in the Asian subcontinent because of the low value of the currency there. India was struggling with tremendous economic problems brought about, in part, by its population growth and a general lack of small industries. India thus was effectively to serve as a crucible in which to test whether a very large and underdeveloped country could attain a more prosperous and stable economy through the motivations of individual citizens. Obstacles were abundant: strong regionalism buttressed by countless languages, opposing religions, and the intricate and pervasive caste system. Though outlawed in 1947, the caste system was still much a part of society in 1955 when SRI people arrived. Although the caste system was awkward for any hands-on American to deal with, more important by far, it was also inimical to generating the economic benefits of an entrepreneurial middle class (see box).

As is often the case in developing countries, both economic development itself and the ability to administer programs designed to create it were lacking in India. Furthermore, information about where a given sector of the economy stood and how to measure its progress was frequently unavailable. Accordingly, SRI's Dr. Eugene Staley (see Figure 15-1) began work in 1955 on the concept of a National Council for Applied Economic Research

NCAER

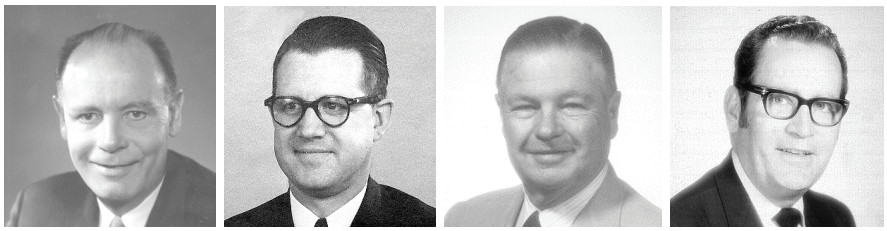

Figure 15-1. Some of the SRI leaders in India during the last half of the 1950s (from left: Dr. Gene Staley, Dr. Ray Ewell, Ed Robison, and Bill Royce).

A MATTER OF SRI ACCULTURATION

A couple of episodes in Ed Robison's early experience in India illustrate the implications of the caste system for business. SRI needed to convey copies of a completed report across New Delhi one afternoon. When Robison asked an Indian associate assigned to work with him to deliver them, he was told that that was impossible because the "driver" wasn't there. When Robison asked him to do it using Robison's car, the associate replied that he couldn't do that kind of work. After some wrangling, Robison said that he would do it all himself, including driving his own car. But the impasse continued when Ed was told he shouldn't carry the reports to the car and that there was no one there "appropriate" to help him. Finally, after Robison voiced his consternation, "porters" were made available, one of whom he drove to the destination to ferry the reports up to the office there. Another incident was precipitated by a number of burned-out light bulbs in the office. When Robison asked that they be replaced, he was told that it would take days to process the requisitions. It was all right, however, for Robison to give his Indian associate the money to go the nearest store and buy some. Good! But when the gentleman returned with the bulbs, no one was available to screw them in.

These events were typical of the acculturation SRI staff would undergo as they learned to live in and come to respect the culture they were in.

(NCAER) that would gather needed data, then be able to speak authoritatively on prevailing economic conditions, and thereafter help evaluate new positions and directions. NCAER was also to examine industry-relevant factors, such as a tax structure, that were more favorable to foreign investments. Many SRI people helped train the Indian staff of the Center in investigative techniques and practices. This non-government, contract-research-based institution was established in 1956 and was unlike anything in India at the time. Now, almost 50 years later, it is perhaps the best, most unbiased, and most often quoted source in India in regard to a wide range of economic, consumer, and labor information.[1]

The need for more small industries was the focus of the second early SRI project. Here again, Staley, working with Dr. Raymond Ewell, designed a Small Industries Organisation (SIO) for the Commissioner of the Government's Department of Industry. Their recommendation was submitted in 1954. By early 1955 Bombay, Calcutta, Madras, and New Delhi had Small Industries Service Institutes that, through sets of investigative teams, both determined the condition of small industries (those with fewer than 100 employees) and helped entrepreneurs attain needed skills in such areas as marketing, manufacturing processes, and management. This initiative helped focus government attention on those sectors of the economy that could improve noticeably with modest investment. And the program had rapid effects. In Madras, for example, the number of small industries rose from 1,524 in 1956 to 2,984 by 1961, almost doubling in 5 years.[A] These small-business programs, which are still part of India's economic development approach, are a means for promoting internal and external investment.[B] The SRI assistance continued for perhaps 10 years, and the insights and quality offered helped build SRI's reputation at the Ford Foundation and in the international assistance field in general.

[1] For example see: www.nira.go.jp/ice/tt-info/nwdtt93/183.html and related sites for the quality and breadth of this nonprofit research council. NCAER's annual revenues are about 21 million rupees or roughly $500,000.

Another early SRI idea was Harry Robinson's conviction that private investments from abroad were necessary to elevate India's economic condition. At his suggestion Indian Investment Centres were created in a number of economic sectors. Again, some of these centers are still operating.

Staley[2] and Ewell left India in 1957, and the SRI leader became Ed Robison, who assumed responsibility for the broad cross-section of work that had been started. In mid-1959, Robison returned to Palo Alto, and William Royce arrived to assume the program leadership of the work with NCAER; Everett Calhoun took over the work with the SIO. Royce was then joined by a highly respected Australian-born economist from the University of California at Berkeley, Dr. John B. Condliffe. By the fall of 1959, 9 SRI staff were living in India, and about 25 had lived or worked there for varying periods since 1955.

Other reflections on SRI's accomplishments in India can be found in the following nomination of Robison for the 2000 SRI Gibson Award for outstanding contributions to society:

- In 1957, Robison took leadership of both SRI development projects in India, the NCAER and the small industries assistance. His work resulted in a book he co-authored with Nanjundan and Staley, entitled *Economic Research for Small Industry Development*.[C] This book is a history of the Ministry of Industries program of work on economic research for small-scale industries.
- Robison's industrial survey reports on small industries resulted in the following economic improvements (paraphrased):
  - SRI assisted in forming several governmental policies at both the federal and state levels. It provided data never before available, including area development and marketing surveys, as well as training programs established in Madras for needed technical people.
  - Robison persuaded the Indian government to pay greater attention to the quality of products coming from small industries so that they could compete better in domestic and world markets. • The program opened the way for liberalized credit to small enterprises by the State Bank of India and extended information services among the four development institutes that were created to aid small industries.
- One of NCAER's early achievements was a series of economic development studies for several states in India that provided them with a degree of planning independence from the central government.

As part of its promotion of small business, SRI also helped design and create in 1962 the Small Industry Extension Training Institute (SIET) in Hyderabad (see Figure 15-2). This school was founded to increase Indians' ability to develop small businesses by assisting and training the officers of small companies.[D] It continues today as the National Institute for Small Industry Extension Training and serves as another example of SRI's efforts to increase economic development through indigenous means. Over the more than a dozen years of SRI work in economic development on the Indian subcontinent, the staff of its International Development Center wrote 11 books.

Following the early years of concentrated on-site work, some SRI staff revisited India to help evaluate progress toward economic development. On the tenth anniversary of the Ford Foundation's involvement there, Robison and Staley returned to examine the progress of small industry development. Much more information was now available to make such an assessment. Given small businesses' growing share of India's industrial output (33% in 1960), they concluded that the prospect for small businesses and factories was "bright."[E] The Foundation's earlier contributions were bearing fruit.

Over the 10-20 years SRI was active in the Asian subcontinent, a large number of important Indian companies became members of its Institute Associates Program (IAP) and its quadrennial International Industrial Conference (IIC) (see Chapter 13 on Economic Development Meetings). In 1981, the Indian members of the IAP urged SRI to hold an investment and development meeting in New Delhi, which it did in December of that year. This gathering, which P.C. Nambiar, Chairman of the State Bank of India, chaired, was intended to make other countries aware of India's investment potential. It drew some 70 such representatives from outside India. As

[2] Staley had a remarkable career, serving on the secretariat of the San Francisco conference that drew up the UN Charter, helping establish the UN Relief and Rehabilitation Administration, and in 1961 leading an economic commission to Vietnam for President Kennedy (*SRI Journal*, 2(1), 9-15,1958). He also published several books on how to enable small businesses.

Figure 15-2. NISIET Center in Hyderabad, India.

background for that meeting, Robison wrote an appraisal of India's progress and the atmosphere for continued economic growth. India had become the world's tenth largest manufacturing country, was self-sufficient in many sectors, and had a substantial and growing middle class. Interestingly, India was perhaps unique among developing nations in consistently honoring its public and private sector debts. But in 1981, numerous impediments remained: India's uneasy relationships with its neighbors, a pronounced unevenness in economic progress across the country, cultural roots that fostered protracted decision-making, and some discouragement of initiative all continued to hamper progress. With this conference, then, SRI's window on India was closing, but only after it had made a long and substantial contribution to India's economic development.[F]

Some of the initiatives taken in India and the quality of SRI work there led to smaller but parallel projects in East and West Pakistan. In the beginning, these projects also dealt with rural and small industry development. An example in West Pakistan was a 1958-59 Ford Foundation examination of the development of better business methods in agriculture. An SRI group consisting of Carlton Wood, William Bredo, and Laurance Bell also found that raising the standard of living there meant encouraging small businesses. As a result of their work, the Pakistani government established the Rural Industrial Service (RIS). Similar to government actions in India, two sites were recommended in Pakistan for RIS Centers. The centers first designed new farming methods for Pakistan and later developed ways to manufacture other equipment and supplies needed by local industries—items that had previously been imported. These Centers also served as training schools for the establishment of new companies. The conflict between West and East Pakistan (the latter is now Bangladesh) pre-empted further work by SRI in those countries.

Bringing Contract Research to Japan

SRI's large International Building in Menlo Park was dedicated in 1969. Leveraged into existence by the untiring efforts of Hoot Gibson, donations came from the Bechtel family for the basic building construction, with the furnishings given by a large number of international friends of SRI. Before its remodeling in 1997, the building's main wing for meetings had rooms known as Uemura, Ishizaka, and Keidanren. These names had roots in a Japanese organization with which SRI developed a long-term association that began in the mid-1950s—the Federation of Economic Organizations or, Keidanren in Japanese. The Chairman of Keidanren at that period was Taizo Ishizaka, later to be succeeded by Kogoro Uemura. When, at the I-Building dedication, Ishizaka was shown the room that would bear his name, he was surprised and responded, "I will do something for you." The excellent calligraphy that came later to hang there was by his 80-year old hand.[3]

Other important industrial relationships developed early on with executives of important Japanese companies: Shibaura Electric Co. (Toshiba), Fuji Iron & Steel (Nippon Steel), Fuji Bank, and Nomura Securities. In the mid-1960s, Yoshizane Iwasa, the Chairman of Fuji Bank, and Shigeo Nagano, Chairman of Nippon Steel, were instrumental in creating, with important SRI assistance, the Japan-

[3] SRI has since leased a portion of that building, and the Japanese artwork is currently in storage.

California Association and the Pacific Basin Economic Council, respectively. These bodies came to be influential in the promotion of trade and investments across the Pacific Region (see Chapter 13).

Certainly, one of the biggest single impacts that SRI had in Japan was the creation of a research organization patterned on SRI itself, the Nomura Research Institute. In the late 1950s, Nomura Securities was looking for a way to contribute to the future of Japanese industrial and economic progress, while SRI was trying to further its position in Japan. Agreement between SRI and the president of Nomura resulted in the seconding of SRI's Dr. Carsten Steffens to Tokyo at the end of 1961. He worked with members of Nomura in the design of the nonprofit Nomura Research Institute of Technology and Economics (which had a familiar ring, NRI). The new Institute was established in April 1965 and within 18 months moved into a new $4 million headquarters in Kamakura, 40 miles outside Tokyo. One of the major vehicles in building NRI was SRI's international fellow program. Some 22 NRI staff spent from 6 to 12 months at SRI learning both research methods and the business processes of contract research. Early on, the new Institute was broadly based in science, economics, and business management. Today, NRI has grown to become one of the largest research organizations in Japan. It has 2,900 employees, $100 million capitalization, a number of subsidiaries, and offices in New York, Washington, D.C., the San Francisco area, and throughout the Pacific Basin.

Beyond contract revenues in Tokyo and Menlo Park, the founding of NRI helped SRI in several ways. First, Steffens moved to establish an SRI office in Tokyo in 1963, and where else but in the Nomura Securities Building in Tokyo. NRI became the first Japanese member of SRI's Long-Range Planning Service (LRPS) (see Chapter 14), with its membership paving the way for the entry of a number of other Japanese companies into LRPS.

Insofar as volume was concerned, most of SRI's other early work in Japan was of a multi-client nature. These studies were centered in the chemical industries as part of the Process Economics Program and the Chemical Economics Handbook (see Chapter 11). By the 1970s, however, more single-client contracts were being won, both in the Business Group and in Sciences and Engineering as well. In 1971, William Royce took Steffens' place as director of what was now the SRI-East Asia office. Before Royce left in 1976, the annual contract revenues had about doubled to $1.8 million per year. This larger volume enabled the establishment of resident research staff in Tokyo by 1974, which had grown to more than 30 members by the mid-1980s.

Although this ongoing work benefited many Japanese companies, Osaka Gas became particularly close to SRI. SRI's relationship with that company spanned a wide range of work involving all of SRI's major groups, beginning in 1982 with a $110,000 project to help the company define a "management vision for the 21st century." The idea was to help Osaka Gas break out of its traditional gas and energy roles by identifying new technologies and business opportunities. Among the first efforts was an innovation search, conducted in Menlo Park by SRI icon Joe McPherson, which defined some 1,000 possible new technologies or business areas. These opportunities were ultimately winnowed down to 3 or 4, and SRI began a series of projects to help explore these and other areas that unfolded. Two SRI people came to play important roles in this relationship: Shigeyoshi Takaoka helped develop the bond between the two organizations, was close to nearly all the senior executives of Osaka Gas, and eventually came to direct the SRI office in Tokyo; and Dr. Paul Jorgensen, vice president of the Sciences Group, became the highly respected advisor and the principal SRI contact. By the mid-1980s, Osaka gas was perhaps SRI's largest commercial client with more than 50 projects distributed across the Institute. This relationship helped swell the SRI project work in Japan to exceed $13 million in 1985.

During this time, several other notable Japanese clients joined SRI's ranks: Fujitsu, for which SRI worked for more than a decade in the field of information technology; Fuji Bank, computer modernization and investment banking strategies; Nissan Motors, marketing, interior car design, and, more recently, planetary vehicles; Sumitomo Bank, analysis of the transition of U.S. credit card practices to Japan; Nippon Telegraph and Telephone (NTT), a study on trade that indicated that the reason Japan was not importing U.S. information technology was not, as hoped, because of superior Japanese technology; and a host of other companies including Mitsubishi, Canon, Nippon Mining, Oki, Hitachi, Ricoh, and Asahi.

One final and interesting facet of our work in Japan was created by a fortuitous political happening. In 1986, amid the ongoing balance-of-trade difficulties that the United States was having with Japan, an agreement was reached between President Reagan and Prime Minister Nakasone that was intended to mollify U.S. concerns. Because of our large import/export imbalance and because Japan was perceived as taking advantage of the large sums the United States was spending on research, Nakasone agreed, mostly symbolically, to fund six research projects in the United States. The projects were competed for nationally and, though the projects were funded through an individual company, in this case NTT, the choice of U.S. research contractors was more broadly based. Of the six projects, SRI won two for a total of $3 million over 3 years and received 60% of the allocated money. One project, performed in the Physical Sciences Division, examined coherent, time-domain optical memory (cryogenic) with extremely dense information storage and rapid access. The other, undertaken in Engineering's Artificial Intelligence Center, explored automatic natural language generation as part of human-computer dialog.

Bringing National Planning to Saudi Arabia

Saudi Arabia is a relatively young nation. The final integration of warring Arab tribes began just after the turn of the century, and by 1927 Ibn Saud (Abdul Aziz) was officially proclaimed King. In 1932, the country became the Kingdom of Saudi Arabia. The discovery of oil in commercial quantities in 1938 would come to give the country a significant role in the world economy. This rapid rise to international prominence, enabled by the infusion of foreign oil investment and technology, belied the general lack of internal development within the country, even in the late 1960s when SRI entered the scene.

Among the nations of the modern world, Saudi Arabia remains an anachronism. Not only is it an absolute monarchy as rigid as many of the middle ages, but in spite of its enormous wealth, its literacy rate is still low in comparison with countries of equivalent per capita GDP.[4] For example, although great strides have been made in the literacy of women, growing from about 50% in 1995 to 70% in 2002,[5] the percentage achieved is still lower than that in many poorer countries. Nonetheless, the past 30 years, beginning before King Faisal's assassination in 1975, have seen this nation, with more than 25% of the world's oil reserves and its largest oil exporter, broaden its economic base and create modern infrastructures in an almost unprecedented fashion. In the decade ending in 1976, the rural population of farmers and Bedouins declined from 75% to 50% as people moved to the cities. That influx, plus the increased number of non-Saudi workers required to build the desired urban expansions, placed an enormous strain on cities, which had little or no existing infrastructures and clearly inadequate housing.

By the time SRI arrived to assist the Saudi government, the pressing need to deal with these changes was evident. The blueprints for change, amounting to $900 billion in government expenditures, took the form of a series of development plans. SRI made important contributions to these plans, with SRI teams providing the leaders of Saudi Arabia and its ministerial staffs, particularly that of the Ministry of Planning, a wider understanding of the public infrastructure and services needed by a state with huge oil resources.[6]

SRI's work with the Saudi Ministry of Planning amounts to perhaps the longest and closest relationship it has had with any foreign government.[G] The relationship was based on helping the Saudis develop a series of four 5-year plans. The first of these projects was won competitively in 1967-68 (see the following box), and they continued until about 1990.[7] According to SRI's Peter Duncan, the plans "provided these leaders and staff with a framework for defining the resources available and the objectives of the national leadership, and then helped to set priorities for the

[4] The huge revenues from oil products are not reflected in the per capita GDP (about $10,600 in 2001) because GDP does not reflect a transfer of one asset, depletable oil reserves, to another, financial assets.

[5] Estimates from the *CIA Factbooks* of 1999 and 2002. The decision to educate women was not made until the 1960s.

[6] As pointed out later below, SRI helped design the Ministry of Planning, which, before October 1975, existed as the Central Planning Organization.

[7] The last 5-year contract, valued at $8.7 million, was awarded in mid-1986.

SRI WINS THE SAUDI PLANNING ROLE

In late 1967, a letter arrived at SRI's Menlo Park offices from His Excellency Sheikh Hisham Nazer, then Minister of State and head of the Central Planning Organization. He invited SRI to bid on a contract to help the Saudi government build an effective program in economic and social planning. The World Bank, as a result of earlier SRI work, had suggested that SRI be a bidder. One of the bid requirements was a formal presentation in Riyadh. SRI was not used to spending that kind of travel money for proposals but did in this case. On arriving in Jeddah, Wilson Harwood (see Figure 15-3), head of SRI's International Development Center, was met unexpectedly by a U.S. Embassy staffer and taken to meet with the ambassador, who offered assistance and stressed that the U.S. government very much wanted a U.S. organization to win. That meeting was an immediate indication of the importance of the proposed work.

The proposal presentation and discussions over the next several days with the minister proved to be more difficult that anticipated. The minister was impressed with the hastily prepared flip-chart presentation and asked Harwood to prepare a formal proposal by the next day. That presentation immediately drew a request for pricing, and the minister would not accept Harwood's protestations that he was not authorized to price the work. Unable to phone Menlo Park, but with help from the Ford Foundation and ARAMCO on local costs, he gave the minister a bid of $1.3 million and went home to face the consequences.

The next interaction came after several months of silence when Nazer phoned from New York saying he wanted to visit SRI. After an afternoon of difficult negotiations in the International Building, the minister declared that it would be very difficult to fund anything over $1 million. When Harwood phoned him at his San Francisco hotel the following morning with a final bid of $1.025 million for the 2-year project, the minister laughed and accepted the bid. The contract date was August 5, 1968.

A measure of the esoteric aspects of the new relationship can be found in Harwood's diary as related in an internal SRI newsletter (SRI Intercom, No. 104, January 15, 1969). "The celebration which followed the signing [of the contract] was held [in the summer capital of Ta'if] on a dry sun-drenched hillside in two large tents, their long sides open to a fertile desert valley below. In one tent, some forty Saudis—Ministers, Deputy Ministers, government officials, the local Bedouin sheik, and I sat cross-legged or stood on several layers of colorful Oriental rugs. We drank aromatic Arabian coffee, highly spiced with cardamom and gingerroot, poured from long-beaked pots through palm fiber filters into tiny china cups. After several rounds of coffee, we moved to the other tent where we settled down to mounds of rice, lamb, dates, olives, goat cheese and butter, various fruits, and breads. Most of the eating was without the benefit of flatware but from yard-wide round trays placed on the rugs."

Later, in October, Harwood met with King Faisal. These formal affairs were indicative of the expectations the Saudis had for SRI work and the ability of individual SRI staff to interact at virtually any level of a client organization.

development within each 5-year period of economic and social development."[H]

The first 5-year plan finally got under way in October 1968, when three other staff SRI members, drawn from other overseas assignments, joined Wilson Harwood in Saudi Arabia. There were early staffing and acculturation problems, however, given the new environment for SRI—a foreign and culturally different kingdom halfway around the world with huge discretionary wealth.

Though the challenges the SRI project people faced were frequent and profound, the work performed was of good quality, and the relationship continued for almost 20 years. Critical to the success, of course, was getting talented, tolerant, and sensitive people to live in Saudi Arabia for extended periods. This meant that in many cases SRI had to go outside its staff to find experts willing to relocate. Tolerance was needed to cope with the crises inevitable with such close support work and in keeping a low profile. SRI's willingness to work in this fashion is just one of the many ways it reserved recognition for its clients rather than for itself.

Not until the first on-site SRI director, Peter Duncan, arrived in mid-1969 did the project gain the stability it needed.[8] He had been conducting other international projects for SRI and thus had some relevant background. The first insight that influenced the course and

[8] Peter Duncan was a specialist in economic development in developing countries, with experience in Nigeria, Brazil, Pakistan, Peru, and Cyprus. He was probably SRI's most accomplished leader for such efforts.

Figure 15-3. SRI's Wilson Harwood and His Excellency Hisham Nazer, Saudi Minister of State and President of Central Planning.

continuity of the SRI work was Duncan's early development of a Plan Preparation Document. This set of guidelines, procedures, and forms helped both in collecting and presenting the information needed as the basis for the plans themselves. The areas the plans were to cover amounted to a cornucopia of varying governmental responsibilities. Education, health, agriculture, housing, water resources, social development, and certainly not the least, petrochemicals, were among the critical needs that this developing country needed to address. Infrastructure expansion included streets and highways, airports, seaports, telecommunications, power, water, and sewer systems. The work was to focus on national growth and on expenditures and investments that would reduce dependence on oil revenues.

Here it should be noted that the SRI work began amid relatively scarce national resources, not the seemingly unlimited Saudi wealth that was to follow. The outset of the planning process was thus one of reconciling the work needed with the limited oil revenues characteristic of 1969. Progress needed to be paced, and prioritization was critical. It was not until 1974 that the price of oil took a spectacular increase, and from that point onward the nature of the plans became more a question of just how accelerated the development could be. The second 5-year plan beginning in 1975 thus took a much different thrust, with a design for a boom in investment, industry, education, and other fields. But overarching all of these important adaptations among resources and their use was the need for modern information systems. These were an early priority.

Thus, over the two decades of its involvement, SRI contributed to a wide variety of national needs. Here is a partial list:[1]

A SIMPLE MATTER OF TIME

Wilson Harwood encountered a totally unexpected example of cultural adaptation on his arrival in Saudi Arabia. His cab driver from the airport wore three wristwatches. On inquiry, he learned that there were three times in play: "airport time," on which planes arrived and departed; "Greenwich Time," which the British had left behind; and "national time," which was used by governmental offices and for calls to prayer. The last of these times was keyed to sunrise and thus varied each day with respect to the other two. On his second day, Harwood's brief meeting with the U.S. Ambassador at 10 a.m. somehow ran unexpectedly and uncomfortably close to one with a Saudi Minister at 6! Beyond his initial confusion over different clocks, Harwood would also learn that meetings in the Saudi culture were never precisely scheduled. Precise time just didn't have that much relevance.

- Development of the industrial sector
- Development of the agricultural sector
- Construction industry capacity and expansion
- Management plan for the Construction Development Office
- Assistance to the Ministry of Municipal and Rural Affairs
- Plans for organizing the new Ministry of Planning
- A simulator training system for plant operators in the process industries
- Curricula for medical and health services at the University of Jeddah
- Planning for vocational training
- Assistance to the Ministry of Health
- Plans for mobile hospital facilities for the Red Crescent Society
- Analysis of housing demand in Jeddah
- Demand for prefabricated housing in the eastern region of the country
- Need for hospitals falling under the Ministry of Defense and Aviation
- Market for computer-based educational systems.

This list, together with the work mentioned below, gives a flavor of the comprehensive nature of the role that SRI filled.

Although the work was considerable, it is difficult to gauge the impact the SRI staff actually had. One way is to look at the degree of importance the Saudis today attach to the development plans in specific areas. First, it is helpful to note the above table showing the periods addressed by the separate plans and the SRI on-site leaders.

Development Plan	Years Covered	SRI Leader
First	1970-1974	Peter Duncan
Second	1975-1979	Peter Duncan
Third	1980-1984	Ray Kelly
Fourth	1985-1989	Roland Wolfram
Fifth	1990-1994	(SRI not involved)
Sixth	1995-1999	(SRI not involved)

At the outset, the government itself was not set up to make or administer such plans. SRI's first job, then, was to help organize various governmental departments so that they could measure the ongoing progress and administer new policies and investments. That first year SRI helped establish an Industrial Studies and Development Centre whose goal it was to increase the contribution of the manufacturing sector to the overall GDP. More generally, an overall objective of the first and all subsequent plans was to diversify the Saudi economy away from one dominated by oil revenues. Any fluctuation in the price of crude oil would have too pronounced an impact on available government-funded services. Here are the specific objectives defined for the First Plan:[J]

- Diversify the economy to reduce dependence on the oil sector and to balance economic development
- Maximize the use of available natural resources
- Reduce the high propensity to import and conserve foreign exchange earnings
- Balance growth in the industrial sector with priority help to industries with a comparative advantage
- Build competitive power in the industrial sector through higher productivity
- Increase the use of national manpower with less dependence on expatriates
- Balance industrial development across the various regions of the country.

Gauging such diversification and balance clearly required an assessment and forecast of the industrial sector over the 1970-74 time frame, which SRI provided. SRI's breadth helped it address the manufacturing sector—from food and beverages, through textiles and furniture, to metals and even light bulbs. The goal was a 12% annual increase in the contribution of that sector to the GDP. Critical to such an economic transformation were the continuing creation of infrastructure and the development of the needed human resources. Eight industrial cities were also built. Essentially all of these changes were financed by oil revenues rather than by private investment. Though private investments were an important part of the general development process, the official incorporation of private capital gained emphasis in the Fourth Plan. A measure of the success of this program was a three-fold increase in GDP from 1970 to 1992, and an accompanying increase in non-oil contributions from 46% to 67%.[K]

Several other sectors were addressed in the First Development Plan: agriculture and water use, specifically self-sufficiency in food production and the conservation of water; health and social services; transportation; road infrastructure; and minerals. Investments in agriculture and water resources increased cultivated land from 400,000 acres in 1973 to more than 8 million acres in 1993. By 1985, the country was satisfying most of its domestic needs in poultry, meat, eggs, milk, fish, and grain, even becoming a net exporter of wheat!

In 1970, the dominant means for movement within the kingdom was by vehicle. In a 1970 study, SRI examined the history of road construction projects and the means to pay for them.[L] At that time revenues from gasoline tax and license fees were posted directly to a general fund, and no notion existed about whether the road system was self-supporting or not. It wasn't, by a factor of at least 4. Recommendations were made for changes in the amount of tax and license fees, including the creation of a new tax on diesel oil.

Given the rapid increase in the price of oil, the financial commitment to the Second Plan was enormous. Whereas the first 5-year plan was allocated $7 billion, the second would require over $140 billion and that amount did not include a substantial private sector investment that had traditionally contributed more than half of all fixed capital formation within the kingdom. The following table provides a rough breakdown of the intended government outlay for the Second Plan, not counting recurring costs.

MAJOR PROJECT DEVELOPMENT BUDGETS
(Billions of U.S. Dollars)

Sector	Project Costs
Defense	17.9
Manufacturing	13.0
Municipalities	13.0
Water and Desalination	9.6
Schools	9.4
Government Facilities	5.7
Housing	4.0
Airports	3.5
Health Facilities	3.5
Roads	3.1
Ports	1.9
Electricity	1.5
Holy Cities	1.4
Telecommunications	0.9
Agriculture	0.7

The plan continued to focus attention on manufacturing, but also addressed many other issues. A Real Estate Development Fund was established in 1975 to provide financing to individuals and private companies.[9] Since its inception, that fund has granted more than $27 billion to over 400,000 housing units. Also during the second 5-year period, Nazer asked SRI to completely redesign his organization as it became the Ministry of Planning. Jim Harsch, then head of Organization Management at SRI, went to Riyadh to prepare a detailed organizational design that was delivered in April 1976.[M] Regarding water use, the Fourth Plan indicated the need for a National Water Plan that would ensure the conservation of water, including water recycling in the major cities and the ongoing regulation of that scarce natural resource. To this day, however, no adequate national water policy has been enacted, and the government only recently formed a Ministry of Water Resources—something that SRI first recommended over 25 years ago.[10]

In preparation for the fourth and final 5-year plan in which SRI had a role, SRI conducted a worldwide economic assessment as it pertained to Saudi Arabia. This comprehensive review provided the important context for the 1985-1989 plan period. Two presentations of that external context were given, one at SRI in May 1982 and another shortly thereafter in Saudi Arabia. The presentation was received so well that the SRI presenters—Don Baron, Andy Kridl, Tom Boyce,

[9] According to Peter Duncan (personal communication of October 29, 2002), this housing money was extended to all Saudi citizens, but not expatriates. Their exclusion was due to the government's requirement that all companies contracting with foreign labor provide housing for them.

[10] Kelly had recently participated in a conference in Riyadh on water use, a need now taking on crisis proportions. Interestingly, the SRI influence still lingers in the Ministry of Planning as Ray Kelly is helping it prepare for the Eighth Plan. (Ray Kelly, personal communication, November 19, 2002)

SAUDI PLAN DEVELOPMENT TOTAL EXPENDITURE (U.S. DOLLARS) AND SECTOR ALLOCATION

Sector	Development Plan						
	1 (1970-74)	2 (1975-79)	3 (1980-84)	4 (1985-89)	5 (1990-94)	6 (1995-99)	7 (est.) (2000-04)
Total Expenditures (billions of U.S. dollars)	7.6	86.8	166.7	93.1	90.9	112.1	130.2
Percent Allocation							
Infrastructure	41	49	41	29	22	16	15
Economic Resources	28	28	31	20	10	12	9
Human Resources Development	21	15	18	33	48	51	56
Health and Social Services	10	8	10	18	20	21	20

Note: the Seventh Plan is in progress and therefore its values are estimates. Also, the total expenditures are approximate because of variation in exchange rates (Ray Kelly personal communication, November 25, 2002).

Charles Greene, George von Haunalter, Peter Hall, and others—were flown the next day to the summer capital in Ta'if to address the entire Council of Ministers. Also important to the project were its subsequent directors: Ray Kelly and Roland Wolfram. Other staff members included Phil Sorensen, Elye Pitts (perhaps the only speaker of Arabic among SRI personnel on the project), Bo Ericsson, Bud Soucie, Jack Van Zandt, Dianne Chaturvedi-Misr, William Grindley, Milan Radovic, Robert W. Smith, Tom MacHale, Ian Napier, Michael Gillibrand, Maclin Sommers, who passed away in Riyadh, and Ed Podesta, whose collection of recorded jazz found its way onto Saudi radio.

The Saudi government's system of 5-year plans continues. The above table, provided by Ray Kelly, who continues to have some role in Saudi planning, shows interesting alterations in priorities over the last 30 years. The biggest change is the shift from economic and infrastructure commitment to social needs. These trends were just beginning in the Third and Fourth Plans when SRI was still participating.

By all accounts, the design and implementation of the series of 5-year plans have brought considerable progress and self-sufficiency to Saudi Arabia. Though its efforts are difficult to quantify, SRI, by its presence at the early stages of the nation's economic and social development, clearly made a lasting contribution to its remarkable modernization. It is fair to say, however, that increases in the price of oil from 1970 to 1983 resulted in the budget surpluses that characterized that time and helped implement such ambitious plans. In 1983, however, oil prices fell and Saudi Arabia became a budget-deficit nation. But diversification had proceeded, and in 1994 only 35% of the country's $173 billion in GDP was from oil or its by-products. Oil, however, was still critical to the economy and to new investments since it still represented 90% of export income.

SRI conducted another important $8.5 million project in Saudi Arabia—this one for ARAMCO. The study concentrated on materials management throughout the company's vast, far-flung operations and concluded with recommendations for the data processing systems necessary to carry out the design.

Iran—Getting Caught in a Revolution

SRI was commissioned to assist Iran in its food production industry as early as 1959. In conjunction with the government agency, the Plan Organization of Iran, SRI helped in the transfer and use of a variety of food processing systems furnished through a U.S. government aid program. The work involved selecting the location of new food processing plants, overseeing their construction, training the supervisors and plant personnel, and even designing containers and their labels. For women workers, special attention had to be

given to the design of working uniforms that were both sanitary and also conformed with the stipulations of their religion. The work of the SRI team, headed by John Perry and Hugh Landis, resulted in increases of 100% in the production of apricots, raisins, dates, and fish within 2 years. A problem encountered with fig production—early blackening from oxidation—led to SRI food specialists helping introduce sulfurization, as well as improving grading and packaging processes. With these changes, the value received for figs doubled.[N]

In the 1960s, many in the United States and at SRI viewed Iran as a country poised to make large strides in economic and industrial development, although social progress was an entirely different matter. Iran thus presented growing business opportunities for SRI. However, only in 1969 did a series of large consulting contracts begin there, and all dealt with energy and petrochemicals. Near-million dollar contracts were won to (1) develop a 7-year plan for national energy policy regarding fossil fuels and hydroelectricity, (2) conduct a petroleum distribution structure study and develop a computerized distribution scheduling system for the National Iranian Oil Co. (NIOC), and (3) develop a long-range energy plan for the Ministry of Energy. Principal staff members in these three projects were Carl Trexel, Tony D'Esopo, and Bill Schumacher, respectively. During this time, several Iranian business leaders became SRI associates, and many more attended the SRI-sponsored IICs of 1969, 1973, and 1977.

In the mid-1970s, the Shah asked U.S. military advisors providing liaison in that part of the world for advice about future telecommunications for Iran. When they responded by sending a couple of sergeants to Tehran, the Shah and his communications people were offended. The U.S. Department of Defense's research arm, DARPA, became involved and in turn asked higher level members of the research community to look into the request. As a result, several SRI staff members were dispatched to help. As it turned out, their efforts were directed to short-term fixes of what amounted to the antiquated equipment used by the Iranian police.[O] Following this episode, the Deputy Minister of State and the Head of the Informatics Department of Iran's budgeting organization contracted with SRI for a 2-month study to define the future directions for teleinformation for all of Iran. Given the existing state of communications resources in Iran and the rapid growth the country was foreseeing, SRI advised a swift transition to the digital age with backbone transmission and switching systems, including packet switching. The system foreseen was to be an advanced, integrated one with wideband terrestrial, satellite, and cable components. When only analog systems were available, such as cable television, converters were necessary.[P] The system was well designed to stand the test of time, but the future simply did not unfold as anticipated.

In 1978, two projects began that would face insurmountable difficulties when the Shah was overthrown in 1979 and U.S. hostages were taken. One was with the National Petrochemical Co. to look into fiber materials. That project was halted with the fall of the Shah, but SRI eventually was paid for most of its work by the new government. Carrying out the other project, which exceeded $1 million and which continued for a time, was considerably more difficult.

In the mid-1970s, an SRI engineer from the Telecommunications Sciences Center (TSC), Ata Hamadani, had gone to Iran under Air Force sponsorship to conduct radar site surveys. While there, he took a leave of absence from SRI and began working for a consulting firm. Because SRI believed in the growth of business in the Middle East, Hamadani was subsequently asked to open an SRI office in Iran, which he did, reporting to Don Fiske, the SRI-Europe marketing manager in Croydon, England. After considerable legal hassle, that office opened in early 1976. One of the reasons for the high expectations for Iran was a $10 million project for NIOC, which SRI began to pursue in 1974. After a year or two of trying, SRI abandoned that pursuit, and by 1977 enthusiasm for work in Iran was swiftly abating. Nonetheless, Hamadani had become aware of an opportunity at the Ministry of Posts, Telegraph, and Telephone (PT&T). To modernize its telecommunications systems, the Ministry had hired AT&T to review its situation and make recommendations. AT&T did not characteristically contract outside the United States but did so under pressure from the U.S. government.

One of the recommendations of the AT&T study was to bring order to the radio spectrum and its use in Iran. That local knowledge of the systems being used and under whose authority they came was all contained in "little black

books" (if they existed at all) with no unified knowledge or organization. To remedy that ignorance, their PT&T needed to buy equipment that would help determine use and begin to regulate the resource. SRI, having built such a spectrum examination and monitoring system for the U.S. Federal Communications Commission (FCC), was in a position to do the same for Iran's PT&T Ministry. SRI's Roy Stehle, who led the FCC work, bid on the project and won, or so it seemed at the time.

The first negotiations between SRI and Iran's PT&T on the purchase of mobile spectrum monitoring units (MSMUs) in the form of vans took place in the late summer of 1976. After SRI representatives traveled to Iran, an SRI proposal was accepted and a contract for $1.4 million was signed in early 1978. Getting started wasn't easy, however, because letters of credit on both Iranian and U.S. banks had to be written and battles waged to avoid paying the kickbacks expected by Iranian officials. Eventually, construction began but not without distractions. During the time the vans were being built, civil unrest in Iran was growing. Still, SRI applied for and received a U.S. export license. But in January 1979, the Iranian monarchy was overthrown, and SRI then had to deal with a new Iranian government. Through all of this, two MSMUs were designed and built in Menlo Park that were state-of-the-art facilities (see Figure 15-4). Their construction was enabled by ongoing progress payments from the PT&T Ministry. Then, and as part of the contract, it came time to train Iranian technicians in the operation and repair of the MSMUs. This led to the arrival in Menlo Park, 6 months late, of two Iranian PT&T engineers.[11] However, less than 1 month after their training sessions began at SRI, Iranians took hostages at the U.S. Embassy and the State Department canceled the export license.[12]

Figure 15-4. One of two radio spectrum monitoring vans built for the Iranian PT&T (November 1980).

Iran's holding of the hostages made for great awkwardness as SRI tried to finish the training phase. The Iranian trainees were as anxious to return home as the SRI staff were to have them do so. After the trainees left somewhat prematurely, the question of what to do with the equipment remained. The gravity of the situation, and specifically the U.S. State Department's embargo placed on the shipment of such equipment to Iran, left SRI in the middle of an international dispute. Nothing happened for months other than the repeated

[11] Actually, one was an engineer and one was an "engineer-watcher." Since the Shah had been replaced by a new, reactionary government, the PT&T Ministry thought it necessary to look out for its people while they were overseas. According to project leader Roy Stehle, one of the trainees was an astute engineer, and the other spent his time watching the other and reading the Koran.

[12] A brief recounting of the setting in Iran at the time follows: In the 1970s, Iran was trying to determine its future path. The Shah had instituted some new freedoms and participatory aspects of government, but at the same time was searching for a non-Western, non-Eastern but Persian way. Coincidently, SRI and the Iranian Institute for Political and Economic Studies sponsored a conference in Washington, D.C., in October 1977 to examine Iran's future. (The proceedings are in a book, *Iran in the 1980s*, published by that Institute in 1978.) Although they did not foresee the revolution, some of the Iranian contributors noted the reactionary forces at play and, in particular, the return to power of fundamentalists in neighboring states at a time when Iran was advocating careful liberalization. After a year of riots, martial law, and demands for his abdication, the Shah fled the country in January 1979. Khomeini returned from exile to set up an Islamic republic. In early November 1979, apparently in retaliation for the U.S. offering medical help to the Shah, 90 hostages were taken at the U.S. Embassy in Tehran. The United States proceeded to sever relations with Iran, embargo Iranian goods, and seize Iranian assets in the United States. The Shah died in July 1980, removing the principal Iranian demand on which hostage release was contingent. The hostages were released in January 1981 as President Reagan took office.

requests from the PT&T Ministry to ship the vans and the establishment of a U.S.-Iran Claims Tribunal in The Hague. The PT&T Ministry's claims and the SRI and U.S. counterclaims would continue to be heard there for years.

At this point of impasse, the PT&T Ministry had paid about $1.3 million of the original $1.4-million cost of the project and wanted its equipment. But for legal reasons, they would get neither the vans nor their money. The case was intricate and protracted, and it demonstrated another measure of the quality of the SRI project leaders and their ability to step into unfamiliar territory. Stehle was asked, with SRI contract and legal staff, to reconstruct all the history and find the relevant material that would constitute the U.S. position. That position proved sound, and the vans were never shipped. However, SRI, because of ongoing equipment maintenance and other legal costs, had to write off several hundred thousand dollars. Moreover, resolving the disposition of the vans took so long that the vans and their equipment eventually became obsolete and deteriorated before SRI could sell them.

Taiwan—A Few Economic Roots

In 1962, the Republic of China (Taiwan) asked SRI to study how the industrial economy of that island country could be expanded and its exports diversified rather than remaining dependent on two major commodities, rice and sugar. As was the norm in such undertakings, funding was provided by a third party, in this case the U.S. Agency for International Development (AID). SRI was not to consider industries already functioning, but to determine which new industries might have economic potential and how they might be established.[Q]

SRI's initial report on the assessment cited four new fields that appeared to justify further examination in the Taiwan setting: petrochemicals; electronics (particularly transistor radios); watches and clocks; and plastics and resins, including man-made fibers. Subsequently, separate SRI teams examined these areas individually, including how they might be implemented. These reports were then made to agencies of the Taiwan Government established to foster economic growth.

Within 3 years of the start of the program, an industrial complex of privately owned plants had been built or was in the final stage in three of the identified fields. A watch and clock plant was to be established soon. By the summer of 1966, 11 companies had started or were about to make a wide variety of chemical products such as nylon, polyvinylchloride, and detergents. These products were anticipated to add $50 million annually to Taiwan's foreign trade balance. Thirteen companies were making transistor radios for both domestic and foreign consumption. More than 1.5 million units were exported in 1965, adding $600,000 in foreign exchange. SRI can clearly claim some credit for this swift introduction of manufacturing capability that helped Taiwan rapidly move away from the need for foreign aid, eventually becoming second only to Japan as the leading industrial country in Asia.

Hong Kong's Transition to Chinese Rule

In the late 1980s, the British Crown Colony of Hong Kong's reversion to Mainland China was only a decade away. Though its economy was one of the miracles of the world, Hong Kong was experiencing some ups and downs. The double-digit GDP growth rates of the 1970s had given way to stagnation in the early 1980s. Part of the reason for this decline was increasing competition from countries like South Korea, Taiwan, and Singapore, complicated by worries over the upcoming return to China. In 1984, a Joint Declaration Agreement had been worked out between the British and Chinese governments to keep Hong Kong on a more or less even keel, but significant uncertainty surrounded how well the Agreement would be honored after transition. What would happen to the private ownership of businesses and property, and what about other individual holdings and wealth? Would Hong Kong's enormous role in the brokering of Mainland Chinese and other Southeast Asian trade continue? The document tried to assure that the transition would be smooth and that the robust economy of the region, with Hong Kong's role as a powerful Asian financial center,

Figure 15-5. Control tower of the new Hong Kong Airport.

would not be threatened. But the forces that drove Hong Kong and that were likely to determine its future were not limited to the two governments. The business leaders of Hong Kong, almost all of whom were Chinese, were the prime movers, and they were understandably worried about the long-term future, Agreement or no Agreement.[13] In retrospect, and fortunately for SRI, this was to be a point and time of great leverage.

The Agreement was naturally firm about matters such as territorial integrity and defense, areas in which the Chinese government required unambiguous sovereignty. However, virtually all other aspects (e.g., local government, taxation, private property ownership and transfer, trade, travel, foreign financial arrangements) were to remain essentially unchanged for the 50 years following July 1, 1997. This accommodation and its longevity were intended to protect the economy of Hong Kong and to make the process of long-term planning predictable. With some assurance and stability, then, economic growth resumed in 1986. Nonetheless, because Hong Kong business and civic leaders felt the need for buttressing their future, a group of them formed the Hong Kong Economic Survey Ltd. and approached SRI. Their knowledge of SRI and its objectivity stemmed from their participation in the SRI-initiated business convocations such as the IIC and the Pacific Basin Association (see Chapter 13). SRI's Center for Economic Competitiveness responded and began work on a $285,000 contract in May 1988. The project leader was Douglas Henton.[14]

SRI looked into three major areas vital to Hong Kong: its role as a port and center of trade, its presence as one of Asia's biggest financial centers, and its future as a manufacturing sector. Of primary concern were both the 1997 transition and the growing competitive pressure Hong Kong was feeling from the other Asian economies. SRI first examined the historical role Hong Kong had played with respect not only to China but also to Southeast Asia and the rest of the world. In relation to these parameters, the influences of Hong Kong's physical infrastructure, labor, land costs, education, and many other critical foundations for an expanding future were assessed.

From these studies and with an eye to other relevant issues, such as the bordering Chinese territories and the political landscape in Beijing, SRI advanced a five-part strategy:[R]

- Maintain autonomy and preserve Hong Kong's uniqueness. Doing so would require the continuation of the existing law on which the economy was based and a set of international agreements on matters such as emigration and the 1997 transition.
- Improve the economic infrastructure. Doing so would entail three objectives:
  - Human resources. Identification of the local educational and training systems needed as well as the emigration/ immigration policies—both to increase the availability of key personnel.

[13] According to former SRI President Dr. William F. Miller, who was personally involved, other concerns also existed. One was the Chinese Government's concentration on growing the industrial strength of the area around Shanghai and the perhaps less important but nagging perception, typified by Deng Xiao Ping's daughter, that Hong Kong was only a place to shop; in other words, would the Government preferentially form or favor an industrial competitor to Hong Kong?

[14] SRI Project 6222 was a 1-year study commencing on May 11, 1988 and financed through Bodwin Ltd. Other project contributors were James Gollub, John Melville, Eric Hansen, Gary Anderson, John Cox, Richard Trampenau, and advisor William F. Miller.

  - Technology initiatives. Increased capacity for R&D and industrial technology incentives.
  - Physical infrastructure. Increased government support for airport, port, and other transport projects.
- Internationalize the Hong Kong economy by:
  - Forming a nonprofit, business-sponsored organization to attract overseas businesses.
  - Developing a world-class telecommunications infrastructure.
- Build Hong Kong-South China economic relationships and expand the economic links to the rest of China.
- Promote partnerships for Hong Kong's economic future. This strategy required a partnership between the Hong Kong government and its business community.

SRI issued the details of its findings and reasoning in a 300-page report, a summary of which it first submitted to selected members of the Hong Kong business community for feedback. The levels of access that SRI had in both Hong Kong and the Chinese government were impressive. Keep in mind that the principals sponsoring the SRI study were among the business elite of Hong Kong. For example, three of them were Mr. Vincent H.S. Lo, heir to a huge Hong Kong real estate, development, and construction operation; Mr. Victor Fung, chairman of the Hong Kong Trade and Development Council and a member of his family's $1.6 billion trading firm; and Mr. Tony Fung, the chairman of Yu Ming, one of the largest investment companies in Hong Kong and vice president of the Hong Kong Stock Exchange. These men and their business cohorts had much at risk, not just from the transition of Hong Kong to China, but also from myriad other concerns such as the rocketing price of property and the labor shortage; in short, the Territory's competitiveness. The historically laissez-faire economics of the British administration didn't seem to be helping much with any of these concerns.

To help convey the results of the study, SRI also met with Chinese leadership at the highest levels. In Mainland China, another transition was occurring that was effectively opening China's door to limited capitalism. In the uppermost Chinese leadership, perhaps the figures most aligned with that change were Zhao Ziyang and Jiang Zemin.[15] Their pursuit of capitalism would be measured, of course, but the most recent decade has shown the remarkable impact of their initiatives.

Access to Chinese leadership would come principally through SRI's President in the late 1980s, Dr. William F. Miller. For a number of years Miller had developed such access, starting with student exchanges while provost at Stanford and continuing at SRI.[16] Also, an acquaintance of Miller's at Argonne Laboratories by the name of Chuan Chu had introduced him to the above two emerging figures in the Chinese leadership, Zhao Ziyang and Jiang Zemin. These varied connections gave SRI important opportunities to discuss the Hong Kong situation with Chinese leadership who were also thinking about it. These began with several meetings on industrial and research policy with the heads of the Development Research Center of the State Council, President Ma Hung and Vice President Wu Ming Yu, and with the Chairman of the Science and Technology Commission of the State Council, Song Jain. Both Song Jain and Wu Ming Yu would visit SRI several times in Menlo Park. With that preamble Miller then met with Jiang Zemin, then General Secretary of the Party, to discuss Hong Kong and the SRI report in the context of industrial development, industrial policies, trade, competition, and the consideration of Hong Kong and nearby territories as what is today a Special Economic Zone. Similar discussions also took place with Zhao Ziyang and Li Peng.[S]

Through these openings, SRI placed before the Chinese leadership the vital role Hong Kong was already playing in the commerce of South China and, moreover, how the brokerage of

[15] These two leaders were instrumental in beginning the economic reform of the late 1980s. As the project got under way, Zhao was general secretary of the Communist Party, but lost his position in June 1989 because of his sympathies with the Tiananmen Square protesters. Jiang followed him in the Party leadership and would become China's president in 1993. Perhaps also of importance was Jiang's career as an electrical engineer and his role as first vice-minister and then minister of China's electronics industry from 1981-93. He would then become mayor of Shanghai, where special economic districts were instituted that significantly changed the atmosphere for foreign electronics investment.

[16] William F. Miller, personal communication, December 12, 2002. SRI interactions with China started in 1979. In 1981 SRI helped China's Development Research Center sponsor the first international conference China had held since it reopened to foreign investment. It was held in Hangzho.

Mainland manufacturing could increase if Hong Kong were left to its own independent brand of commercialism. SRI's five-part strategy for Hong Kong also helped galvanize those who were still timid in the Territory, particularly following Tiananmen Square. But in spite of that event and others, significant capital investments have been made throughout China, and the manufacturing prowess of the adjacent South China provinces has grown extremely fast. Even Taiwan-owned manufacturing plants, along with their Taiwanese managers, are now operating on the Mainland north of Hong Kong.[T]

The Economic Plight in Equatorial Africa

SRI's work in Africa began in 1959 and continued until the 1990s. The Rockefeller Brothers Fund contracted for the first projects, in which SRI examined how impoverished countries might enter into new businesses, ranging from introducing a poultry industry in Ghana to a ceramics industry in Nigeria. Nigeria itself sponsored an important SRI study of its internal transportation services in 1960. A project for the UN made recommendations to Sudan on improving its food processing systems and establishing an industrial research institute. Nearly all of the work in Africa in the 1960s was sponsored by the U.S. Agency for International Development (AID); the work involved 12 regions or countries (e.g., Nyassaland, Morocco, Cameroon, Tanzania, Egypt). SRI's examinations often delved into the important sectors of national economy and well-being. Only two studies will be touched on here—a brief one in Cameroon and a much more detailed one in Zambia. These will not be SRI success stories, but they serve to illustrate the extreme difficulties in bringing economic vitalization to equatorial Africa.

Cameroon

In 1960, the southern or French colonial segment of Cameroon gained independence. Within a year or so the southern part of what had been two British Cameroon colonies voted not to join Nigeria but to join with the new government as West Cameroon. (Another, turbulent decade would pass before the remaining British colony would also join to make a united Federal Republic of Cameroon.) In the initial union, the new State of West Cameroon was virtually devoid of resources, having only a small agricultural and timber economy. Accordingly, in 1964, under the sponsorship of that new federal government and AID, SRI sent a team of economists and technologists to find ways to stimulate "all sectors" of the economy in West Cameroon. The SRI team, led by Frank Turner and composed of Philip Adams, Peter Duncan, Ed Podesta, and a few consultants, focused on West Cameroon's entire economy, its people, and its resources.

Under the contract, which was for about $175,000, the development team assessed the state's agriculture, transportation, telecommunications, business and small industry, healthcare, education and manpower, and the present and latent tourist industry. Input was made to the proposed 10-year development program (1965-1975), which sought to triple GDP and raise per capita GDP to about $150. The SRI team recommended that the banking institutions and sources of international credit and investment, then concentrated in the capital at Yaounde, be extended to West Cameroon. SRI also identified proposed investments whose revenue potential should attract investors. Firms then in East Cameroon and Nigeria could contribute significantly to initiate industrial products such as beverages, textiles, cement pipe, footwear, timber products, and plantations for tea, rubber, oil palm, and possibly pepper. Importantly, the new state also needed to be more adequately integrated into the development programs of the Federal ministries. Only then could the policies that governed the attractiveness of outside investment in West Cameroon be clarified.[U]

For a decade or so after independence, Cameroon was prosperous by African standards. But as with so many African countries the economy was at the ultimate mercy of what turned out to be unstable, often repressive governments. In spite of sometimes noble beginnings, these governments—and Cameroon's was no exception—often gravitated to despotism, with the economy at the mercy of the despot's whims or the turmoil that attended leadership transitions. In the late 1970s, those types of events indeed took place in Cameroon, and by 1984 the country's commodity-dependent economy, fiscal mismanagement,

and civil unrest caused a decade-long recession and a large decrease in per capita GDP. While the 1990s brought some recovery to the region, the volatility of governance and other indigenous problems made helping African economies a gargantuan task. That truth was also brought home to SRI after it had expended great effort in Zambia, as detailed below.

Zambia and Copper—Struggles in a Developing Country[17]

This is a tale not of triumph but of frustration, a story about good intentions and a lot of work undertaken to surmount enormous difficulties but with few residual benefits. The work is thus important not for its outcome but for its illustration of the lengths to which SRI people and sometimes their clients have gone to help the developing world. It is also indicative of SRI's socially responsible work. The story here covers SRI work from the early 1980s to the 1990s to help revitalize the copper industry in Zambia.

Background

Located in south central Africa, Zambia was known as Northern Rhodesia during the British colonial reign. The area was colonized in the late 1800s by the British South Africa Company, and when that enterprise failed around 1924, the British assumed rule. The British South Africa Company had developed mining and commercial interests in the country that included the rich copper ore deposits discovered in its northern region in the early 1920s. Over the next 40 years or so Northern Rhodesia experienced the typical imperialism and exploitation of the day. But with European knowledge and in spite of its interior location, it came to be one of the world's leading copper exporters, as well as a net exporter of food.

However, none of this relative success brought more than subsistence benefits to the native people, and little or nothing was done to prepare them to assume the technical and managerial roles so critical once the country became independent.

Zambia gained its independence peacefully in 1964, and its independence was accompanied by both good and bad news. The good news was that, unlike some of its poorer neighbors, it had a developed copper mining and smelting industry with a history of strong export value, and its per capita income was one of the highest in Africa. The bad news was that it was a single-industry country, and few, if any, indigenous people were qualified to run the pivotal copper industry. Some British expatriates stayed on to help run mine and smelter operations. But as the anticipated transition to independence and the possible nationalization of the copper industry appeared on the horizon, its foreign owners stopped making capital investments. As a result, the mines and smelters deteriorated badly.

Along with the deterioration of the copper industry, agricultural output decreased, changing Zambia from a net food exporter to a net importer. Zambia's first independent government was a socialist one that lasted for more than 25 years. Even though the country did not experience the degree of corruption that other emerging African nations suffered from, the government's economic practices, although well-intentioned, produced only economic failure. After a few years of private operation, the copper industry was nationalized, with the Anglo American Plc owners maintaining only a minority share.

However, the economy was worsening. Like all emerging African countries, Zambia's people were poor. At the time of independence, their $640 per year per capita income was higher than many of their neighbors'. By the early 1980s, however, when SRI first arrived, it had fallen to less than $500 per year, and by 1998 it was only $330. Zambia's problems were increasing dramatically.

While SRI's first work in Zambia began in 1966 with a brief examination of its transportation systems, it was 1983 when Dr. Eugene Thiers, director of SRI's Mineral and Metals Department of the Business Group, helped SRI win the first of two large rehabilitation projects for Zambia's copper industry (see Figure 15-6). That project, which

[17] Much of this account came from a series of interviews with Eugene Thiers, Bill Schumacher, Tom Boyce, and Gary Bridges (April 2001 to October 2002), all of whom had project leadership roles over the course of SRI work in Zambia. Boyce was also head of the SRI Energy Center at the time of the second large project.

Figure 15-6. SRI project leaders for the two major Zambian projects: Gene Thiers, Tom Boyce, and Bill Schumacher (left to right).

was funded by the newly nationalized copper company, the Zambian Consolidated Copper Mines (ZCCM), was a detailed diagnostic assessment as a preparatory step in modernizing the aging industry. This was clearly an opportunity to help a people in desperate need, and SRI's assessment would become the basis for a petition to the World Bank for funding the rehabilitation itself. That the rehabilitation of their copper industry might have been beyond even the powers of the World Bank to remedy wasn't considered. The need was simply too great. If the economy of Zambia was to improve, it had to start with its copper industry.

Both before and after independence, Zambia's almost total dependence on copper was dangerous economically. Since 1965, that industry has accounted for between 25% and 50% of the country's GDP—the amount depending mostly on the world price of copper. Significantly, in the early 1970s and in spite of a trend away from profitability and toward overemployment, a Zambian mine worker contributed 25 times as much to GDP as an agricultural worker and 3 times as much as a worker in manufacturing.[V] The lack of economic diversification meant that through the 1980s copper continued to account for 90% of foreign exchange for Zambia.[W]

The most important aspect of the Zambian dependence on copper and what brought SRI and the World Bank into action was that the Zambian government, in its 20 years of independence, had treated ZCCM simply as a cash cow.[18] Rather than reinvesting in the country's most critical industry, it siphoned the money off into other domestic uses. Moreover, foreign exchange money, derived almost totally from the export of copper, was the only currency with which to buy foreign goods and services. The local currency, the kwacha, was highly unstable. Thus, the leaders of ZCCM, undoubtedly along with their government overseers, became preoccupied with the industry's gross foreign exchange currency and lost track of the profitability with which it was being generated. Importantly, it was at a time when competition in the world copper market was increasing. The government mistakenly believed that if it could continue to export the traditional 500,000 or so tons of copper each year and get foreign exchange money, that was all that was important.

As a consequence, as the 1980s approached, ZCCM's business had grown perilously inefficient and the necessary equipment and facilities had seriously deteriorated. Desperate for outside help, the new socialist government of President Kaunda sought funds from every quarter to upgrade mining operations and otherwise run the country. Both Western and Soviet Bloc loans arrived, but because of poor management and onerous stipulations placed on the aid packages, all new equipment, sent directly or purchased, included no spare or replacement parts. An unfortunate consequence was that, when new equipment broke down, it simply sat unused. Obviously, equipment from the West couldn't be used to help repair that from the Soviets and vice versa. In addition, a government tax on *incoming* mining and smelting equipment also served to reduce the flow of spare parts, further depleting the already insufficient stable foreign exchange money allocated to pay for them.

The falling world market prices for copper, combined with domestic borrowing in the late

[18] ZCCM was formed at the time of the government's purchase of the controlling interest in overall mine operations from a set of foreign investors with stakes in separate areas of Zambia's Copperbelt.

1970s that amounted to about 10% of Zambia's GDP, plus external borrowing, made indebtedness a huge factor in the faltering economy.[X] Nationalistic fervor didn't help either. A government policy to move expatriates out of important positions at ZCCM caused an outflow of skill, with expatriate employment falling from 16% in 1964 to 3.5% in 1983.[Y] Importantly, those who left had occupied the most critical jobs. This policy was reversed in 1982, but by then the damage had been done. To make matters even worse, mine output decreased, as did the quality of the copper ore. This affected productivity in two ways: the annual ore output per worker fell from 12.3 tons in 1973 to 9.7 tons in 1981, and yield fell from 43 tons of ore needed to produce 1 ton of copper in 1973, to 53 tons of ore needed in 1983. [Z, 19]

A failing economy, clearly exacerbated by inefficiencies; a volatile and shrinking world price for copper; and a siphoning off of reinvestment money to meet the country's employment and social needs, all contributed to a desperate situation in the late 1970s. Zambia was spiraling downward. Nonetheless, Zambia remained the world's third or fourth largest copper exporter in the mid-1970s, the Zambians within the ZCCM given responsibility for turning the company around were dedicated and hardworking, and the country had been spared the horrendous internal strife from which most of its neighbors suffered.

Externally, the World Bank and the International Monetary Fund were still willing to provide what surely must have seemed unrecoverable money to help rectify these enormous problems. As the 1980s arrived, as a condition for continuing World Bank loans, ZCCM was required to get outside help in formulating plans for more effective use of the international loans. Enter SRI.

SRI's First Large Project for ZCCM

SRI's specific role was to help ZCCM prepare for a low-cost $400 million loan from the World Bank. World Bank money had been pouring into Zambia throughout the 1970s. Production, after reaching a peak in 1976, was falling. The Bank was looking for a plan that would not only bring about higher production and profitability to ZCCM, but also help stabilize and enhance the Zambian economy.

This project eventually led to a series of five projects funded by the World Bank. But work started with ZCCM funding a comprehensive diagnostic survey of all of its operations. The table following shows the scope.

To address this array of tasks, the initial team, led by Eugene Thiers and consisting of five SRI staff and one consultant, left for Zambia in 1983. That first team included several former executives of international copper companies. As the projects progressed, they enlisted the help of perhaps 20 SRI staff members, as well as outside consultants. These included talent in metallurgy, mining, the economics of world trade, and organizational structure and training, as well as specialists from U.S. companies expert in mining and smelting processes and respected at the World Bank.

The team made its appraisal. They found that the mining operations were a serious bottleneck in reaching a production goal of 630,000 tons per year, and this finding suggested a 20% increase in development funds was needed for the two mines with falling production.[20] Metallurgical operations, while not pacing production at the time, had severely deteriorated and would limit production once mining operations were increased. Processing plants were observed to have excessive spillage and loss. Closer auditing and monitoring were needed to fix this problem. Purchasing and inventory practices were fragmented and required reworking to create common inventory and cataloging across all divisions to indicate overall critical equipment availability. Improved inventorying would also help avoid the accrual of unnecessary spare parts and promote the disposal of obsolete stock. SRI presented its final report to ZCCM in September 1983. The report was given orally, with written backup, and consisted of pointed and specific assessments and recommendations in all the areas of the following table.

[19] According to Thiers, the SRI on-site leader for the first several years, the reduction in copper per ton of ore was due to dilution—the result of poor mining practice that lets low-grade ore or waste earth from other shafts fall into adjacent areas yet to be mined. To the extent that this composite is re-mined, it is of a naturally lower copper content.

[20] In 1976, when Zambia was the world's fourth largest producer of copper, it reached peak production of over 700,000 tons per year; that amount compares to the 500,000-600,000 tons produced in the 1980s, and was comparatively huge in relation to the 256,000 produced in 2000. [*MBendi's Email Mining News*, www.mbendi.co.za]

ZCCM AREAS OF SRI INVESTIGATION	
Operations Mining Metallurgical Plants Productivity Measures	Facilities Underground Equipment Maintenance Open-pit Equipment Maintenance Metallurgical Equipment Maintenance
Budgeting Capital Operating	Central Services Computers Purchasing Practices Inventory Control Accounting Practices
Personnel Zambianization Training Discipline Motivation	Other Corporate Planning Duplication of Efforts Communications Transportation

To drive home existing problems and their implications for future budgets and budgeting, SRI presented comparisons with copper-producing facilities in other countries. The data showed ZCCM to be less efficient in cost per ton mined for surface and subsurface mines, somewhat more competitive in ore concentration, and quite efficient in refining and smelting processes. To be continuously alert to company competitiveness, a common accounting and budgeting practice across all divisions was needed. SRI thus recommended that operating and capital budgets and long-range planning be integrated across ZCCM.

Most telling, though, was that corporate objectives and the role of corporate planning were not clearly understood across the company. Disparities also existed between short- and long-term operational planning and between capital and operating budgets. Recommendations were also made in training and organizational structure.

Following SRI's input, ZCCM successfully presented the revitalization plan to the World Bank, and a $150 million loan was disbursed. Both ZCCM and the World Bank praised SRI for its thoroughness and objectivity.[21] Now it was time for the changes to be carried out—a hugely more difficult job—and SRI would continue to be involved. Five more, somewhat smaller projects ensued, all concerned with implementing the recommended procedures in planning, budgeting, materials management, and the monitoring system and tools with which to carry them out. These projects lasted from the end of 1983 until mid-1986.[AA] Beginning in 1987, SRI undertook a further series of three projects on organizational training (see the box at the end of the section). With this training work, the total contract value for this initial work came to nearly $2 million. To what extent were SRI's recommendations implemented?

As operating procedures were changed and equipment upgraded, productivity started to increase and unit costs dropped. That was clearly rewarding. But frustration set in soon after the SRI team left Africa. Some of the promised actions can be found in the previously referenced World Bank report:[BB]

- In February 1984, the government and ZCCM admitted the need for reducing the work force, trimming the compensation for Zambian workers, and closing uneconomic mines. The president had rejected similar proposals as late as 1982.
- A 5-year production and investment plan was to be prepared for the World Bank by December 1985. (SRI's work would contribute here.)
- The government and ZCCM were to agree on taxation and dividend policies by the same date.
- The government agreed to allocate to ZCCM, for its use only, the foreign exchange equivalent of $350 million in 1984 with future allocations subject to World Bank approval.

All these actions appear positive and in keeping with SRI's recommendations. Some 4,000 workers were let go;[22] the structure of ZCCM was streamlined; and review, procurement, and planning practices were revamped. But Zambia's nearly total dependence on the Copperbelt remained.

[21] Gulhati (op. cit.) indicates that this intensive rehabilitation program, the first serious attempt to address ZCCM's problems in a long time, preceded loans of $148 million from the World Bank, the European Economic Community, and the African Development Bank in March 1984. Tom Boyce indicated that the experts on the SRI team had done their work well.

[22] Still, just under 6% of the 67,000 workforce.

Unfortunately, the copper industry supplied not only the only income for the people in the Copperbelt's vicinity, it was also the only source of electricity, drinking water, sewage treatment, and medical care.[CC] Needless to say, it was difficult for the government to shut down a depleted or low-producing mine. In more direct fiscal ways, government actions had predatory effects on the industry. In 1983, the government had initiated a 4% tax on the gross value of exports. That tax continued to increase, reaching 10% in 1985. Then, when a plan was introduced to devalue the local currency, the Government doubled the export tax to 20% to keep ZCCM from windfall local currency gain. Though a compromise reduced the export tax to 13%, that tax, together with the normal tax on net profits, severely damaged the fiscal engine that was to drive the rehabilitation of ZCCM. Furthermore, the government failed to create a long-term plan for taxes and dividends for the copper industry that would provide for the reinvestment needed. Thus, unwise government leadership managed to undermine the principal means for economic revitalization of the country, and SRI's work came to naught. The copper exports critical to Zambia's economy continued to decline.

SRI's Second Project

In 1991, the Zambian electorate ousted the long-standing and ineffective socialist government, installing a multiparty, democratic government called the MMD in its place. With the copper industry still bringing in virtually all foreign exchange money, yet still unprofitable, the question arose about returning it to private ownership. Given ZCCM's troubled history, that appeared to be the only reasonable course, but it was also clear that many would oppose any such action. In June 1992, the new Government established the Zambian Privatization Agency to promote the selling of government-owned industries, including ZCCM.

SRI's return to Zambia came from an invitation faxed in early 1992 by a trusted, knowledgeable, and respected ZCCM leader, Edwin Koloko,[23] who was involved in SRI's earlier work. He was now in charge of privatization at ZCCM, and his request was straightforward. Could SRI help the government and ZCCM bring their copper business to a point of profitability so that it would bring a greater return when sold? This was rather like painting a house before selling it to bring a higher price, though the work entailed was infinitely more complex. Unlike the 1984 study, this study would not be an open-ended planning exercise. Given the government's near-term privatization interests, rapid results were imperative. However, seeing them through would turn out to be a much bigger challenge than the diagnoses and changes SRI had tried to make 10 years earlier. This endeavor would take somewhat less time, about 3 years, but would approach $18 million. The work was again funded by the World Bank, which was still trying its best to help Zambia turn the corner to self-sufficiency.

This time Bill Schumacher was the project leader with Tom Boyce as his deputy (see Figure 15-6); the two alternated in being on site in Zambia. They recruited many of the same people who participated in the first project, although many more would be added. This time, however, all were more aware of the difficulties in making changes in Zambia even when everyone's intentions were good. To create more rapid and lasting improvements, the project would have to have sufficient clout to invoke wholesale changes, which would have to be made while the SRI people were still involved.

Following a brief appraisal phase, SRI developed a work plan for the project that created 12 analysis and implementation modules (AIMs). Each module was assigned a team, led by SRI or its subcontractor specialists, and staffed jointly with key ZCCM people. These teams were not just study groups; they also had to worry about implementing the changes needed. The following table shows the aspects of ZCCM operations addressed.

Each AIM had a specific set of objectives, issues, plans, schedules, and, importantly, deliverables. Deliverables included both a summary of findings and an action plan; that is, something executable. The AIM work was to be carried out during the first 6 months of 1993 with consequent changes to ZCCM operations occurring soon thereafter. It was up to AIM 12 to assess the commercial value of ZCCM's operations, based on the implemented AIM

[23] A Ph.D. in international economics, Dr. Koloko had left a university teaching position in Pennsylvania to return to his native country to help out. SRI staff knew him to be both capable and of high integrity, and representative of many of the Zambian people with whom SRI worked.

AIMS FOR ZCCM OPERATIONS IMPROVEMENT	
1. Geology, Reserves, and Resources	7. Training
2. Mine Operations and Planning	8. Maintenance Management Systems
3. Smelting/Refining Operations and Planning	9. Material Management Systems
4. Finance and Accounting	10. Marketing
5. Human Resources	11. Environmental Review
6. Corporate Organizational Structure	12. Divestiture and Privatization

recommendations, and to define a strategy to maximize that value for Zambia.

The output of the teams was thorough and voluminous. Their first integrated output was an interim short-term corporate plan. To help project both corporate needs and the ongoing ZCCM financial situation, the plan recommended critical actions needed from each team and also addressed external factors such as the price of copper and cobalt (in this case a copper coproduct), the availability of essential goods and services, and the tax situation. Considering the size, history, and importance of ZCCM to Zambia, this undertaking was both difficult and important.

The AIM implementation activities were often extensive. New foremen were placed in those areas of the mines and smelters where most improvement was needed. This time the smelter was the biggest bottleneck. Overemployment remaining from the socialist government meant employees would have to be laid off. Because ZCCM had been conducting sales in dollars and paying for expenses in local inflationary currency, daily financial assessments were impossible to make. Substantial changes in an item's cost would occur between the time it was bought and when it was paid for. Consequently, SRI retained an accounting firm to bring in some of its people, working with an Australian mining company, to Zambia to install a whole new computer and bookkeeping system.

A notable achievement was getting ZCCM to pay more attention to its cobalt resources. Zambia has perhaps the world's largest reserve of cobalt. Cobalt is not only about 15 times more valuable per pound than copper, it also represented a product diversification. Moreover, the company's easily accessed copper tailings were rich in cobalt.

Originally, the AIMs were intended for short-term turnaround and SRI's/ZCCM's interim plan extended only to 1995/96. However, a pressing need developed to look out to 10- and 30-year horizons in support of buyers who had long-term interests in profitability. But between these two periods and before privatization had run its course, the price of copper took a dive that would frustrate the privatization process. In 1998-99 copper fell from around 90¢ per pound to 70¢, and apparently neither SRI nor the Zambians saw that price decline coming. Given the expectations of the Zambian government and the reality of the marketplace, this change effectively delayed privatization. What capital selling did occur was handled by Rothschild Bank, and SRI was never privy to that process.

Outcome

While the original intention of ZCCM and the government might have been to seek a single buyer that would make the investments needed to return production to where it was 20 years before, it didn't turn out that way. Either because the government saw ZCCM as its "crown jewel" and had an exaggerated view of its worth, or because it placed too many conditions on the sale (e.g., responsibility for cleaning up prior environmental pollution), it ultimately wanted more than any buyer was prepared to pay.[24] It had broken ZCCM up into 11 component packages, each of which was for sale. The first and perhaps most important consequence of this decision was to drastically delay the sale and thus the inflow of cash. This delay severely affected production and caused substantial reductions in GDP, particularly in 1998 when the price of copper fell to 70¢. The other, seemingly obvious downside was that the more valuable pieces would sell easily, but those with greater problems might find no buyer at all, leaving the Government with the

[24] According to *African Business*, December 1997, the government and ZCCM were asking $1 billion for two prominent ZCCM divisions that included six mines and their associated copper refining facilities. A consortium that included Phelps Dodge bid only a third of that amount, and negotiations broke off.

cost either of continuing operation or of cleaning up.

Privatization in Zambia began in 1993 and continues. The privatization process included not just ZCCM, but banks, insurance companies, utilities, and oil and telecommunications companies as well. The biggest parts of ZCCM were among the last to be sold, but not until early 2000. Curiously, the buyer of the final part, and of a number of other ZCCM assets, was the large South African company, Anglo American Plc, the prenationalization owner in the 1960s. ZCCM remains a minority stakeholder in a number of the new operating companies.

Did SRI make a positive contribution to the life and times of ZCCM? Certainly it did. But long-term benefits for the Zambian people as a whole are harder to pinpoint. The SRI project staff speak very highly of the Zambian people they came to know. Many were trained abroad and knew their field well. Many helped carry out SRI's recommendations better than the few expatriates who were still in leadership at ZCCM. SRI and its subcontractor colleagues worked with dedication and brought a great deal of expertise to the project. As with many consulting situations, the consultants brought a fresh perspective that those immersed in the problem either did not have or found too much difficulty in implementing. While each incremental task SRI and its associated experts completed seemed to make a temporary difference, in retrospect and in aggregate, they were effectively overwhelmed by governmental predilections and the international economic climate.

A final lesson for this kind of endeavor may be to recognize the enormous inertia of poor countries and their accompanying ability to absorb great amounts of aid without reflecting much change. Even though copper, because it brought in solid currency, was the best single leverage on the Zambian economy, it is but one aspect of a complex socioeconomic and cultural matrix. Lasting changes in such an environment must treat the entire country and must somehow involve the majority of citizens in working toward a solution. It is a measure of the good people of Zambia that, with but one brief coup attempt in 1997, they have spared themselves the tribal and anticolonial hostilities that have befallen many African nations. By 1999, Zambia's GDP growth was again positive; it was the world's largest producer of cobalt but still twelfth in copper production. Nearly all of the mining assets had been privatized, and the new owners committed $2.5 billion to improve efficiency and expand operations.[DD] Some 250 other companies had also been privatized. But the country's rise to self-sufficiency, particularly given the onslaught of HIV/AIDS, where one in five adults are infected,[EE] still seems illusive and distant.

One of the major difficulties in postcolonial Zambia was the lack of an education system for training people in the operation of the important copper mining and processing industries. Accordingly, part of the service SRI provided in the 1980 phase of the work was staff training. Because of the broad need for skilled indigenous staff and the dependence of the general population on success in the Copperbelt, this work, and the training part in particular, was as socially responsible as any SRI would ever undertake. In spite of the overwhelming problems and the physical and cultural distances, those who went to Zambia to gain the insights necessary to evaluate and correct the situations they found developed a fond attachment for the people and knew that what they were doing was truly beneficial work.

SRI's training work began with a failure. Its first proposal for this phase of the work was rejected in favor of a competitor, who, it turns out, performed poorly. This was learned when the manager of ZCCM's Supply Department came to SRI in December 1984 and among other things wanted to talk to the people who had written the SRI training proposal, Gary Bridges and Paul Jones. This manager invited Bridges to go to Zambia and make a needs-analysis of the human resources department, but he indicated he could cover Bridges' expenses only. So, salary-free, Bridges spent a week there and concluded that the 700-person department could benefit from sending groups to the United States for customized training—something that would prepare them for their current and future jobs.

Accordingly, four sets of 12 Zambians spent approximately 3 months at SRI and 12-13 other relevant locations such as the Magna Copper Mine in Arizona. These SRI sessions were supplemented by four 2-week sessions in Zambia. The outcome of this training was very satisfactory. Attendees acquired needed management and assessment skills, learned how to interact with the other nationalities with which they had to deal, and received some sense of career planning.

The conditions for the average person in Zambia were dramatically illustrated when the students arrived at SRI. Some came with their personal possessions in paper bags. Because their company had given them a comfortable living allowance for the trip, on Tuesday mornings the students were taken to a local thrift shop where they bought needed clothing. As their departure neared, some bought huge suitcases to fill with things for their families—including food. These were graphic lessons about a less privileged world.

For the half-dozen SRI staff members who participated, the training phase was a very satisfying time. The Zambian students who came to the United States participated in teamwork-building experiences at nearby personal and professional development sites, went on excursions, and were entertained at staff members' homes where they prepared their native food and everyone sang Zambian songs. One of the trainees named his daughter after one of the SRI team members, and some of the relationships continue to this day. This project thus serves to illustrate the caring and empathetic nature of the SRI staff.

Postwar Revitalization in Lebanon

SRI is engaged in ongoing work in modern Lebanon that continues the tradition of the work described above, but now conducted in the economics practice that is part of SRI's Policy Group. Though the Business Group's efforts were discontinued in 1998, this economics practice has functioned successfully for the past 20 years as part of the Center for Science, Technology and Economic Development based in Washington, D.C. Its mission has been the same throughout its tenure: to help struggling economies right themselves and bring about a higher standard of living. Whereas many staff members have obviously contributed, John Mathieson is the one who has led the economic policy group to a position of worldwide respect in its work in 115 countries and more than 60 states, regions, and communities (see Figure 15-7). Here we consider one of its major ongoing projects—the economic revitalization of Lebanon. Now in its fourth year, the work is sponsored by AID.

In the 30 years following WWII, Lebanon, and Beirut in particular, had been one of the Middle East's most prominent financial and tourist centers. But in the mid-1970s, a protracted civil war, heavily influenced by outside interests, radically changed Lebanon. This story thus begins in the aftermath of that war, which ravaged Lebanon for more than 15 years. The struggle there has faded from world attention because of other Middle East strife and the tendency in Lebanon not to discuss the war or its ramifications for fear of threatening the reconstruction process.

Figure 15-7. John "Matty" Mathieson, director of SRI's Center for Science, Technology and Economic Development.

The fragile system in Lebanon had been unraveling due to the increasingly radical actions of the Palestinian Liberation Organization (PLO) and other groups of Palestinians, who had resettled in Lebanon and Jordan after being forced out of Israel. The conflict started in earnest in 1975 as politicoreligious battles were fought among competing religious factions—Christians and Shiite, Sunni, and Druze Muslims. Almost at once external forces joined the fray, with Israel supporting the status quo Christians, and with Syria and other Arab states backing the Muslims. By the late 1970s, Israel, worrying about its northern border, would also enter the conflict, invading Lebanon in 1982. Private armies were formed and major powers, including France, the United States, Russia, and a variety of UN peacekeeping forces, tried to intervene. As a result, the civil war became even more complex. Though a peace treaty was finally signed in 1989, turmoil continued until 1991, and the wartime factions remained as impediments to post-war recovery, hindering cooperation in rebuilding. That is one reason why Lebanon sought outside help.

AID, which had been offering humanitarian aid during the war, shifted its emphasis to rebuilding after the treaty. By 1996, it was providing money for community groups and universities to reconstruct infrastructure and train people in relevant fields. But the economy was in a shambles and getting worse. Consequently, in 1997 AID asked SRI to assist in the economic revitalization efforts as the first U.S. consultant to arrive after the post-war travel ban was lifted.

The first job SRI tackled was to determine the most effective means for stimulating sustainable economic growth. SRI concentrated on two areas: the creation of a macroeconomic model for use by Lebanese policy makers and industry cluster development. The model was used to help understand the chronic budget shortfalls that were contributing to a huge and continuously increasing national debt, a towering 120% of GDP at the time. The segments of industry selected for improvement were agriculture, light industry, tourism, and regional financial and business services. SRI's first year was devoted mostly to design and the establishment of relationships of trust with Lebanese stakeholders. Because both the government and the private sector had bought into SRI's public/private collaboration approach, even among competing factions, AID proceeded the next year with implementation. Through all of this, SRI created partnerships not only with government and industry participants, but also with working partners, including the Lebanese American University and the Beirut-based firm, Information International. The implementation of these selected economic reform packages continues today.

SRI's strategy for the 1999-2000 fiscal year was to involve Lebanese stakeholders in building action plans. The stakeholders (incidentally an SRI-coined term[FF]) included both private and public sector leaders. The action plans used specific, targeted initiatives to solidify the various industry clusters and indicated what should be done to create a collective competitive advantage. Take, for example, the tourism cluster. Before SRI's work, each of the depressed hotel businesses acted alone. To help spur tourism, SRI designed and facilitated a private-sector-led Council for Tourism consisting of major hotels and tourist associations. Other SRI initiatives included crafting a new hotel rating system, conducting tourism worker training activities, and developing a series of marketing and promotion strategies and activities. As discussed below, SRI's approach is working.

In 2002, the emphasis changed slightly to encouraging the industrial clusters identified to embrace various regions in the country, including rural areas. As an example, for

Southern Lebanon SRI identified the elements needed to build an economic zone: human and natural resources, infrastructure, and existing enterprises that could be expanded. SRI began working with rural olive oil producers and growers of herbs to take advantage of expanding overseas markets for these products. In the tourism area, SRI helped develop package tours for rural ecotourism and cultural tourism to take advantage of Lebanon's rich natural and historical assets. The SRI team also helped reduce the "digital divide" by assisting in the establishment of community-based Internet centers in rural areas.

Strengthening the various parts of the commercial sector is, of course, a necessary long-term step in economic revitalization. But it is clearly not a quick road to solvency at the central governmental level. That involves either reduced expenses or increased taxes, or both. In the meantime, Lebanon's burdensome deficit continued to grow as a result of the high costs of postwar reconstruction. One role SRI played in this equation was its advocacy of a value-added tax, or VAT. Starting in 1998, at the request of the Minister of Finance, SRI prepared a full analysis and a complete rationale for invoking a VAT. That tax was finally initiated in February 2002 and, along with some hoped-for expenditure reductions in 2003, should help reduce future deficits.

How have SRI's suggestions been working? Feedback from the Lebanese government and private sectors has been encouraging. But, like all high-inertia systems, including governments used to satisfying different constituencies by providing public employment, such economic reforms take time. As noted, the economic picture was dismal when SRI's work began. Public debt was, and remains, extremely high, further exacerbated by artificially high interest rates. However, there are encouraging signs that the Lebanese economy has turned around. In spite of the highest debt-to-GDP ratio in the region, in 2000, a zero-growth year, the UN economic agency for Western Asia forecast Lebanon economic growths of 1.4% and 2.5% in 2001 and 2002, respectively. And, in fact, according to the Lebanese Central Bank, Lebanon's GDP grew by 3.6% in 2002 at an inflation rate of 1.8%. Whereas the International Monetary Fund projected a negative $1 billion balance of payments for Lebanon in 2002, the country produced a surplus of $1.5 billion. That growth is attributed to an increase in both tourism (nearing a million visitors in 2002) and the number of new industrial firms (doubling over the 2 years ending in 2002). Lebanese banks are also regaining some of their prewar status as the strongest in the region. Holdings at the end of 2002 were almost $43 billion, or 2.5 times GDP. VAT is also expected to work, as indicated by a budgeted revenue growth for 2003 of about 18%, and budgeted expenditures are slated to decrease by about 7%. If both initiatives work as planned, the deficit should go down substantially.[25] Only time will tell, but the initiatives are in place.

If and when Lebanon returns to economic health, it will, of course, be hard to gauge just how much SRI's work has helped in that process. But SRI's ongoing participation in the joint government-industry initiatives has certainly made positive contributions.

[25] Fourth quarter 2002 numbers from the Ministry of Finance as quoted by the Economic Research Unit of the Bank of Beirut and the Arab Countries.

Intellectual Property at Risk in the Philippines

Intellectual property rights (IPR) are the legal means governments use to ensure that the producers of new arts, science, and technology reap the rewards of their investment, effort, and creativity. However, such rights face a variety of new challenges around the world. Theft of intellectual property (IP) in Southeast Asia in particular represents one of the world's biggest impediments to the integrity of IPR, with numerous IP-pirating factories found in countries in the region. The advent of software as a marketable commodity, with its underlying digital technology that enables all forms of software and entertainment media to be copied cheaply with complete fidelity, means that the lure of piracy has become too attractive for some to ignore. Illicit replication is a problem both for the countries where the counterfeiting takes place and for countries to which they export the illegal goods. Globally, the loss from IP infringement to the United States alone is estimated at nearly $10 billion annually, and one of the primary culprits is the Philippines. Although that country had been trying to deal with the problem for the past 20 years, when the digital decades arrived, its laws proved outdated and its enforcement, typical of the nations in the region, was weak or effectively nonexistent.

SRI, which had developed insights into IPR practices in developing countries under an AID project concluded in 1990,[GG] was invited by the Philippine Exporters Confederation in 1992 to map out a comprehensive strategy for the reform of that country's IPR policies and practices. SRI first examined the adequacy of the existing laws and then tackled the various investigative, prosecutorial, and judicial parts needed for an effective enforcement process.

Before detailing the SRI findings, we need to understand why the Philippine exporters were concerned in the first place. What factors motivated them to want to improve the treatment of IPR? Beyond the intrinsic goal of establishing and strengthening respect in Philippine society for the efforts of its inventive and artistic population, at least one important external reason motivated them to want to enforce IPR laws: trade with the United States. That trade is critical to the Philippines because the United States is by far the country's largest export market, exceeding $1 billion annually. Because U.S. imports amount to perhaps a quarter of that amount, the United States is obviously interested in how its IP is treated in the Philippines. A U.S. evaluation of IPR efforts indicated that the Philippines should be on the U.S. Priority Watch List. Being added to that list had considerable implications for tariffs on Philippine exports to the United States—adding perhaps a half a billion dollars annually. The Philippines has been on and off the list. In 1993, under an agreement between the U.S. chief trade negotiator and Trade and Industry Secretary Rizalino Navarro, the Philippines was removed from the list. Part of the reasoning for doing so may have been the steps the country was taking to revamp its IPR activities.

Let's now look at what the SRI study found and the effects of its recommendations. According to an account in one of the Philippines' leading newspapers, SRI found the following shortcomings in its examination:[HH]

- Constraints on IPR adjudication
  - Low priority given to IPR protection
  - Inadequate resources and training for IPR enforcement
  - Possible judicial bias against foreign multinationals
  - Lack of knowledge of IPR laws among agents and courts
  - Lack of coordination among IPR enforcement agencies
  - Overall inefficiency in the judicial system
  - Corruption
- Legal problems
  - Overly technical and stringent evidentiary requirements
  - Inadequate fines and criminal penalties
  - Tenuous legal authority among enforcement agencies to expedite violations
- The adjudication system
  - Difficulties in getting receipts to prove sale of counterfeit items
  - Difficulties in establishing identity of IP violators
  - Problems in finding witnesses to sign affidavits
  - Limited availability of judges

  - "Protection" offered to infringers by "influential friends"
  - Lack of storage space for seized goods
- Prosecution difficulties
  - Respondent's inability to answer subpoena and notices
  - Liberal extensions by prosecutor for respondent to appear in hearings.

The review, in short, uncovered pervasive weaknesses in the Philippine IPR activities. The recommendations were in keeping with the increased emphasis on IPR in the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) and included the increased prevention of IP violations and the streamlining of the IPR adjudication process.

What happened next is interesting. Within a couple of weeks of the public announcement about the study, President Ramos committed publicly to the strict enforcement of IPR, something he had informally done during the final presentation of the SRI report in February 1994. He instructed Secretary Navarro to work with other government officials to task the Supreme Court to establish special IPR courts. Initiatives already under way, such as an Interagency Committee on IPR, were strengthened by his reaffirmation of a 1971 international accord on IPR. His public statements also vowed that Filipino inventors, artists, writers, performers, composers, and musicians would gain international recognition of their rights and that, "The role that the intellectual property system plays in the country's economic and industrial development cannot be overemphasized." This was the domestic spin on what also was a critically important export trade issue. But the underground industry's infringement on IPR ran deep.

The SRI study had both immediate and continuing effects as the Supreme Court formed special IPR courts in 1995 and as new IPR laws emerged in 1997. However, no legal change is any more effective than its enforcement, and anyone familiar with policy reform in a developing country like the Philippines can tell you that ongoing vigilance is required, particularly when powerful interests are at stake. The actions taken as a result of SRI's recommendations had enormous potential, but enforcement of the new changes was not sufficiently permanent. As a result and also in 1997, the Philippines was once again put on the Priority Watch List, in part because of the IPR courts' inability to seize pirated materials. As recently as 2002, the Philippines was spending only $500,000 on IPR enforcement, the country remained a major haven for illicit manufacture and sale of media like DVDs, and U.S. Trade Representative Zoellnick still included the Philippines on the Priority Watch List.

Assessing a Country's Science and Technology Practices

SRI, through its Center for Science and Technology Policy based in Washington, D.C., has found an important research niche in evaluating a nation's commitment to science and technology (S&T). For years the group has worked with the National Science Foundation (NSF) in the evaluation of NSF's own programs and of those the Foundation shares with other regions of the world. As a result of these efforts, SRI's reputation in this area has become truly global in scope. As evidence, it has performed S&T evaluations for Argentina, Australia, Brazil, Chile, France, Germany, India, Italy, Japan, Malaysia, Mexico, South Korea, Sweden, Taiwan, the United Kingdom, Venezuela, and others. We briefly look at three of these evaluations: one for Malaysia, one for the U.S. Congress regarding S&T cooperation with Latin America, and one evaluating our Department of State's Fulbright Scholar Program.

Malaysia

In the last two decades, SRI has undertaken more than 20 projects sponsored from within Malaysia. While these projects were mostly for private corporations, including those in petrochemicals, many were conducted for the Malaysian government. These latter projects concentrated on an extended assessment of Malaysia's ability to implement advanced manufacturing technologies. Malaysia was anxious to participate in burgeoning Southeast Asian production of the components for the information age. One government-sponsored SRI project in the mid-1990s assessed whether Malaysia had the human resource potential for a planned increase in its S&T industry.

Interest in this subject area began in 1992 as Malaysia's Ministry of Science, Technology, and the Environment began a biannual assessment

of achievements and the state of its human resources in technology. In particular, the ministry wanted to know whether the Malaysians could use S&T to usher the country into the ranks of developed nations. In work jointly sponsored by the Ministry and the UN's Development Program, SRI also looked at the country's investments in R&D.

As part of that evaluation, in 1995 the ministry asked SRI to help gauge the present situation and predict what would be needed out to a 2020 horizon. This ambitious, 2-year undertaking involved large-scale, multidimensional surveys of Malaysian industry and the kinds of talent both currently employed and needed; the kinds and levels of investments required and who might offer them; and the educational system, including overseas training.[II] The setting at that time found that part of the world in an economic slump, and Malaysian ministers were wondering if that slowdown would erode their S&T base.

While many perceived a shortage of technical talent, there were no data to back that belief. As a result, SRI conducted surveys that probed more than 3,500 companies that might use scientists and engineers. More than 60% responded, giving a statistically significant basis for helping build the econometric models needed for the long-term forecast of labor demand. The industry response confirmed an estimated 20% shortfall in technical talent. Moreover, the most critical shortages were in the high-skill levels needed to drive the targeted areas of economic expansion. The good news was that the trends were positive and that the government had already put in place many of the policies, programs, and investments to address the problem.

The SRI project team, led by Catherine Ailes (see Figure 15-8) and Roberts Coward, made recommendations affecting the educational system, various kinds of R&D investments, and labor and R&D policies. The work was so well received that in May 1998 the large, well-supported report was made an official document of the Malaysian Cabinet and used in setting government S&T policies. Though the fraction of Malaysia's GDP devoted to R&D is low, it has been growing; from 0.22% in 1996 to 0.5% in 2000, with about 60% of that percentage coming from the private sector.

Figure 15-8. Catherine Ailes, director of SRI's Program in Science and Technology Policy.

U.S.-Latin America S&T Cooperation

In the 1988 Authorization Acts for the NSF and NASA, Congress directed that the NSF work with other federal R&D agencies, including the Department of Energy (DOE), carry out an independent study to first assess and then promote U.S. collaboration with Latin America in science, technology, and space. This requirement became the impetus for an SRI project with NSF. As one can imagine, the subject was amorphous, given the breadth of the tasks and the unevenness with which our neighbors to the south engage in S&T. To limit the scope of the investigation, the topics to be considered were confined to biology, astronomy, geosciences, physics/materials science, and engineering. Moreover, the work concentrated on five countries: Argentina, Brazil, Chile, Mexico, and Venezuela. Though the report to Congress resulted in a bill that never became law, it was and remains one of the only descriptions of such hemispheric collaboration. Selected outcomes of the study follow.

Beginning in the late 1970s at a time of political unrest in Latin America, the S&T relationships the United States had with the region lost visibility and perhaps the interest of most Americans, including lawmakers. A decade later, the flow of U.S. S&T funds to our Latin neighbors continued to diminish. Similarly, the number of Latin students coming to the United States peaked in the 1982-83 school year,

whereas the numbers of those from Asia and the Middle East continued to rise. Even specific initiatives, such as one with Brazil in 1986, didn't affect this trend. On the other hand, intrahemispheric concerns about economic development and trade have become more visible concerns in recent years. Does a relationship exist between S&T and the ability of Latin American countries to gain greater economic stability and independence? Another dimension in the relationship has been the practice in Europe and Japan of picking up the S&T slack in Latin American left by the United States.

First, the SRI team looked for the extent of ongoing cooperation in the chosen disciplines. With the exception of specific areas such as astronomy and remote sensing, where the Southern Hemisphere offered unique access to space, the various S&T fields evidenced more potential than practice. A common theme, however, was a sophisticated research community that was underused because of lack of funding, instrumentation, and access to information. And there seemed to be a desire to increase hemispheric scientific interaction through graduate fellowships, personnel exchanges, and enhancements in communications, especially computer networks.

Perhaps the major conclusion of the study was that S&T could play an important role in solving Latin America's international debt problem and, through growth, in having the region secure an improved place in the global economy. Panels, led by U.S. researchers and comprising U.S. and Latin American members, were assembled to identify a variety of ways that these changes could take place and the organizational means needed to carry them out. Recommendations were made for each of the chosen technologies, for each of the five countries, and for specific methods to improve human resource development, research exchange programs, instrumentation upgrades, library quality, and communications.

As a result of SRI's defining the problems, the NSF has undertaken initiatives to increase its involvement. One recent example is a joint enterprise with DOE to fund the Pan-American Advanced Studies Institute, which offers short courses that are intended to stimulate collaboration among early career scientists and engineers. Intrahemisphere networks that include most Latin American countries have grown up among the various scientific centers. Though the outlay for R&D as a fraction of GDP is still low in Latin America (0.5% or one-fifth that of the United States), the 1990s saw a 36% increase in technical publications, second only to that of China. Finally, high-technology manufacturing, including pharmaceuticals, grew steadily in the 1990s in Brazil and Mexico, and Mexico and Costa Rica are now net exporters of high-technology products. Thus, progress is being made.

Assessing the U.S. Fulbright Scholarship Program

The Fulbright Program for international educational exchange has become an integral part of U.S. public diplomacy. Since its instigation just after WWII, the program has benefited more than 250,000 men and women, U.S. and foreign, in a wide variety of academic disciplines and has involved over 140 countries around the world. The Program is funded by the State Department's Bureau of Educational and Cultural Affairs, and that organization asked SRI about 3 years ago to review its practices and the value of its outcome to the United States. Of the Fulbright Program's seven components, SRI was asked to examine the Scholar Program—both for U.S. scholars sent abroad and visiting scholars—and the U.S. and foreign components of the Student Program.

In September 2002, SRI issued a report on the U.S. Scholar Program, those U.S. scholars sent overseas. SRI found strong evidence that the program is meeting its goal of promoting mutual understanding and cooperation with other nations. The executive director of the Fulbright administrative arm said, "The study demonstrates and quantifies the impact of the…Program for the first time. It underlines the value of the program to America's international relationships and also to Americans' understanding of other nations. At a time when the world is so endangered by lack of understanding, the…Program is a beacon of hope." The SRI researchers found an unprecedented level of agreement among all Fulbright alumni, foreign and domestic, that their experiences were valuable, and that they had acquired a deeper understanding of their host countries and a heightened awareness of social and cultural diversity.

The U.S. survey consisted of a random sample of slightly more than 1,000 Fulbright

alumni whose grants ran from 1976 to 1999. Specific results included:

- The grant activities were diverse, not just classroom teaching.
- Virtually all grantees became active in their local communities.
- The overwhelming majority of the scholars were able to impart new knowledge, form ongoing collaborations, and later welcome host country colleagues on their visits to the United States.
- Three-quarters of scholars used the experience to bring a greater international flavor to their home campuses.
- A large majority reported that participation gave them expertise they would not otherwise have had.

The SRI staff is now condensing information from interviews with foreign scholars about their experiences in the United States (e.g., a Ukrainian web site mentioned that the SRI team met with nine local Fulbright alumni in May 2002). SRI analysis of its interviews with Visiting Scholars will be forthcoming. In the aftermath of 9/11, many Americans are wondering how nations and cultures can gain better understanding of one another. If the ongoing work supports the early results, SRI may be able to provide the first evidence of the value of the Fulbright Program in achieving that end.

Telecommunications Privatization in Britain and the Birth of Vodafone

In 1979 the conservative government of Prime Minister Margaret Thatcher adopted a policy that would create a 10-year program to privatize large sections of the economy, including industries such as coal, steel, and water, which had been nationalized under a previous socialist government. In Britain, as in many European countries, telecommunications was still part of the public sector of the economy. Privatization of telecommunications in Britain was therefore of great interest to governments across Europe and elsewhere because it would bring about two financial windfalls. One was simply the government income inherent in the transfer process itself. The second derived from the need to move this industry into the digital age, wherein those costs could be transferred from the public to the private sector. In Britain, telecommunications was almost entirely held by the public company, British Telecommunications (BT).[26] But a desired step, preliminary to its privatization, was the government's policy decision to open up the new cellular communications world in Britain to competition.

Though private ownership and operation of telecommunications services already existed in other countries, most notably in the United States, such arrangements were not common in Europe. This action of the Thatcher government can be seen as a vanguard for a trend that still continues more than two decades later in many corners of the world. But our story about SRI's hand in this (r)evolution opens and, to a great extent, closes in Great Britain.[JJ]

In the summer of 1982 the British government initiated the privatization process by opening up a part of the telecommunications market by means of inviting bids for a license to run a privately operated national cellular phone service. BT would also be given a license automatically. The government saw the need to get a first-class cellular phone service up and running quickly to provide BT with serious competition. BT was considered lethargic, overstaffed, and in need of a wakeup call. In addition, this exercise would provide some guidance on the implications of subsequently privatizing the whole of BT.

The government agency tasked with managing this privatization was the Department of Trade and Industry (DTI). The person to lead the effort within DTI was Jonathan Soloman, who had recently worked in Downing Street for former Prime Minister James Callaghan. Soloman was charged with the stimulation of the electronics industry and the revitalization of the telecommunications industry in the United Kingdom. However, DTI did not have the internal expertise to evaluate the cellular bids that would follow and hence

[26] BT was formed in 1981 by its extraction from the British Post Office to be come a state-owned corporation with a near monopoly on telecommunication.

requested the outside help of Robert Perrin of SRI's London office.

Robert Perrin had developed a strong personal track record with DTI and had a close working relationship with Soloman. Perrin had led an SRI project that provided a series of very high-level seminars on the technical, industrial, economic and social implications of developments in the microelectronics industry. This series, which used a range of speakers from SRI-Menlo Park, bolstered SRI's credibility by providing wide exposure to SRI among top-level decision makers in both the private and government sectors. It was in these circumstances, then, that Soloman invited SRI to bid for the needed assistance. The familiarity with DTI and the important link to Soloman energized Perrin and the SRI-London office and eventually helped SRI-Menlo Park overcome its initial reluctance to bid.

This diversity of view reveals an important aspect about SRI. SRI management had notable reservations over the years about the role of overseas offices, which were opened and staffed largely by the Business Group. Were those offices to be independent research entities with a degree of self-determination, or were they required to support operations in Menlo Park, leaving most of their activities devoted to marketing? This ambivalence surfaced from time to time, and the indecision no doubt hindered the growth of the Institute. In spite of this issue, however, SRI conducted numerous successful projects in which Menlo Park people were temporarily assigned overseas. This cellular telephone project happened to be one of those.

Another bit of fortunate timing followed the microelectronics seminars. SRI-Menlo Park had decided to form an electronic industry section in London and chose Charles Mason to head it up. This move proved to be ideal for the DTI opportunity because Mason had previously been an attorney of the U.S. Federal Communications Commission. Mason's background in the US, where telecommunications services were offered privately, albeit regulated, was valuable in England, where such knowledge was in short supply.[27] He was also to be a vital link with Menlo Park resources. Hence, in the summer of 1982 Robert Perrin and Charles Mason passed an oral examination before a set of DTI staff and won the contract.[28]

The aim of the project was to help set up the process and specific criteria for evaluating bidders for the new, privately offered, part of the cellular service. Once the criteria were in hand, SRI was to evaluate each bidder. This work was to be carried out with attention to the Thatcher government's objective: creating real competition and achieving visible "success" with this private licensing effort. Because that outcome was so important, SRI at times met personally with Kenneth Baker, the DTI minister. Because such comprehensive cellular service was in its earliest stages, the decision-making process had to be invented "on-the-fly." Of critical importance was that everyone involved view it as fair.

SRI selected four dimensions for bid evaluation: technical, marketing, financial, and management. In each category several criteria served as "gates" that could shut out unqualified bidders, whereas others were less stringent but still helped rank the applicants. Of the seven initial bids, one was rejected early for obvious flaws and one was voluntarily withdrawn. Evaluations continued for the remaining five. Then, to allow those bidders to adapt to what was sought, the evaluation was carried out in a flexible and interactive manner. That ongoing evaluation made SRI's job both more difficult and more important.

The technical evaluation began with the SRI-Menlo Park team of John Lomax, Dan Allan, and Aki Shohara creating a technical performance model. This mathematical model, embracing a variety of technical factors such as channel reuse and spectrum efficiency, enabled direct engineering comparisons of the proposed systems and their ability to provide an acceptable nationwide quality of service. Keep in mind that the government had not yet specified a cellular standard, and that bidders drew on emerging standards from the continent or the United States.

Having a common basis for comparison was critical. Another important technical factor was that the new private cellular switching system would almost certainly be all digital, whereas

[27] However, the U.S. long-distance telecommunications market was itself in the process of being deregulated, along with the breakup of AT&T; the latter occurred on January 1, 1984.

[28] Project 4845, Radio Telephone License Application Appraisal, was initiated September 9, 1982 and was scaled in cost according to the number of bidders. The contracted price was $165,620.

BT's primary land line telephone network was still analog. Because 1982 was a time of transition from analog to digital switching, given the latter's innate ability to offer more services, the new company would have the advantage over existing BT equipment. That equipment's continued use was locked in by depreciation schedules that were many times the life cycle of the new digital systems.

After conducting a technical evaluation of all the bids, the Menlo Park team came to the view that although some of the bids were thorough, none of them came up to the required standard. Consequently, all the remaining bids were rejected. Curiously, all five bidders had links to large private telecommunications companies with considerable technical backup and were indignant that SRI was criticizing their bids on technical grounds. Philips in the Netherlands was particularly scathing, brushing SRI-London aside and flying a large team direct to SRI in California. Insisting their bid was technically sound, a lively scene ensued as numerous faults in their technical plan were exposed by SRI staff. The Philips team quickly returned home to redo their submission.

But as it turned out, after numerous discussions between SRI and the individual bidders about critical problems in their technical approaches, one bidder withdrew and the remaining four were coached to a level of technical acceptance that passed the "gating" muster. This normalization was viewed as desirable, if somewhat surprising in a competitive bidding process, because of the required consistency and interconnectivity of the combined cellular-wireline system.

The overall conclusion of this first phase, then, was that all bids had strengths and weaknesses. One could not say one was technically stronger than the other. The British government was therefore told that the bids could not be selected purely on technical grounds; the wider issues of finance, market appraisal, marketing, and general staffing needs also had to be compared. In this way the other dimensions became the deciding factors.

On the basis of its in-depth marketing expertise, some acquired in a recent study of the Swedish Telecommunications market, SRI found that the first round of proposals was vastly inadequate in this area. Only one bidder even addressed the nationwide market. Others devoted too little attention and resources to marketing and educating the public on the potential benefits of cellular services, which were largely a curiosity to the man in the street. Some also drastically underestimated the market, providing, in SRI's eyes, too little competition for BT services. In the financial area, one bidder had the clearest understanding of the tariff structure and the highest estimate of system users. Two others either had inadequate financial resources to launch a successful system or were too conservative in their growth projections. One bidder (Racal-Millicom) had a bold plan that committed it to installing seven regional control switches in the first year of operation. SRI later learned how appreciative the remaining bidders were for the initial criticisms.

To deal with this more comprehensive phase of the evaluation, the SRI project members included Jacques Popper, Frank G. Pyne, and Alan Thurgood.[29] Pyne was a chartered accountant and led the financial study. Thurgood led the management evaluation, believing the management plan was now a very important part of the decision. This was particularly critical in the light of the uncertainties a new private company would face in providing telecommunication services across Britain. The focus of SRI's evaluation in this regard was telling:

- Business and service record of the lead/ sponsoring company.
- Similar records of the other active members of the consortium
- Caliber of the proposed management team
- Ability of the active members of the consortium to handle a venture of this nature
- Flexibility and ability to manage change
- Commitment of the lead company and the consortium members
- Perception by management of the opportunities and risks presented by the venture.

The discussions held with Kenneth Baker, the minister involved, were to consider these wider issues. It was a high-visibility project. The telecommunications industry was very excited, yet in SRI's opinion, none of the bids were good enough. SRI therefore proposed to give each bidder a critique of their proposal. Each critique

[29] Alan Thurgood was the former managing director of ITT companies in England.

would obviously be different, and each company would be guided in the right direction to make their bid acceptable.

This novel approach generated a range of reactions. Some were too proud and confident to listen, and challenged SRI's ability to criticize their bid fairly and knowledgeably. However, one bidder's response was quite different. Racal was the leader of the Racal-Millicom bid. Millicom, a U.S.-based, Swedish-owned R&D firm, had a sound base in U.S. cellular technology. Racal was a relatively small manufacturer of military (mostly Army) radio equipment and sold nothing to the public. Gerry Whent ran the most profitable side of Racal and saw his market was declining. He persuaded his chairman, Ernest Harrison, to go in for the cellular bid. Many on Racal's board were initially against this move, but Whent was eventually given the go-ahead, provided he first resign his current job.

Gerry Whent was a tough, astute executive and was very quick to learn. Faced with SRI's critique, he readily agreed that Racal's marketing plan was ineffectual and their financial plan seriously incomplete. Although Racal's own estimate of market size was far in excess of all the other bidders, Whent readily accepted the SRI reasoning that even they had grossly underestimated the market potential for cellular communications.

Whent gratefully grasped SRI's comments. Then, with great enthusiasm and a greatly increased budget, he took over the entire top floor of a large Heathrow hotel and rapidly flew in extra staff from Sweden and the U.S. They all worked round the clock and weekends. Armies of advertisers, accountants, and lawyers were summoned while secretaries toiled endlessly. The outcome was an immensely improved and impressive bid that far outshone those of the other bidders. They decided to call the new venture Vodafone.

Given this turn of events and the resulting offering, SRI decided that Racal-Millicom was the best bidder, and that they could indeed give BT serious competition. SRI therefore recommended that the government select the Racal-Millicom bid. The SRI team had been convinced that cellular telephones had an enormous potential for growth, far beyond what a complacent BT or even the other bidders had estimated. The scale of Racal's planned investment surprisingly eclipsed by a wide margin the plans of their competitors, who were already in the telecommunications market and would have been expected to know latent customer demands. Subsequently, some complained that Racal's investment plans were unreal, and that they would never be implemented as promised in their bid. But it could be asserted that this Racal plan, created at high speed and under very great pressure, nevertheless became the foundation of Vodafone's subsequent success.[30]

But the evaluation battle was not over. Because of its overall importance, controversy surrounded the decision and the DTI decided to appoint three very senior impartial and well-respected executives to provide a second opinion.[31] The panel agreed to review the process as long as they were allowed 8 weeks to do so. So, the SRI team was requested to justify, under detailed scrutiny, how it had conducted its evaluation, made its analysis, and reached its conclusions.

Quite naturally, this critique was initially viewed with misgivings by the SRI team. However, to the team's great relief, these three wise men quickly declared they were unanimous in their agreement with SRI's methodology and conclusions. One of them, Sir Brian Carlsberg, subsequently was appointed the chief executive of the Office of Telecommunications, the cellular industry's adjudicator and watchdog. He had said that much of the methodology used by SRI was subsequently used as their standard practice, and Frank Pyne's financial modeling was especially appreciated. With the review panel's affirmation, then, the government accepted SRI's recommendations and announced Racal-Millicom the winner.

Time would show that Vodafone not only out-competed the BT cellular system in Britain, but would go on to become the world's largest supplier of cellular services.[32] Chris Gent had

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[30] Regarding its ability to compete effectively with BT, Vodafone quickly jumped to holding a 55% UK market share and has always remained ahead of BT. This was yet another example of a worldwide trend; the ensconced wireline carriers often failed to lead changes in personal wireless communications, digital or not.

[31] Such a top-level audit of a project was unusual. However, the political, financial, and competitive implications of the initiative were monumental, and DTI was being careful.

[32] Sometime after the DTI work, Mason, Perrin (both then at another firm), and Dan Allan of SRI conducted another project for a gentleman who was hired into Vodafone from ICL. The project suggested that Vodafone introduce value-added cellular services such as stock quotes, which proved

been brought in after the bid was won, and in due course took over from Gerry Whent while Ernest Harrison (by now "Sir") had resigned. An article in the 25 January 1999 issue of Business Week provided a depiction of Vodafone's ascension to the top of the industry and gave a striking example of the assimilation of cellular service. Chris Gent was watching a cricket match in Australia when he heard Bell Atlantic was offering $45 billion for the largest U.S. cellular provider, Air Touch. Using his cell phone, and without returning to England, he quickly put together his own $55 billion stock and cash offer. The deal was eventually approved, making Vodafone, then Europe's largest mobile telephone company, a worldwide giant with $10 billion in annual sales and a capitalization of $105 billion.[KK] As of April 2003, Vodafone's subscriber list is the world's largest at 112 million users. The SRI team was proud of its prediction of the explosive growth of cellular services in 1982 and of its insight in how that market should be addressed. What better confirmation could one expect?

Returning now to the specific area of privatization, SRI was asked by DTI's Jonathan Solomon to undertake a second much smaller, but still significant, project. This was to help with one of the issues associated with the actual privatization of British Telecommunications. The Treasury wanted the privatization to raise £4 billion from the sale of BT shares. The questions were: What was the approximate value of a BT share, how many shares would therefore need to be sold, and consequently, what proportion of the company would then be left in government hands? To address these issues SRI needed to know, at least in general terms, the scope for cost cutting at BT (e.g., staff redundancies), price increases in relation to other European countries, and the expected revenue increase from market growth. An attendant question was: How does one balance the desire to increase prices with the political and economic desire to keep down inflation?

To get a handle on these questions, SRI conducted a short comparative analysis between BT and other European PT&T's yet to be privatized, as well as telecommunications offerings in Japan and the U.S. After removing effects like inflation and currency exchange, it became apparent that BT was much less efficient than corresponding providers elsewhere. Though BT customers had only seen a slight increase in costs in the last decade or so, measured in hours worked to pay their phone bills, their costs remained far above those of Germany and France where corresponding costs had dropped substantially in the same period.

SRI also determined that the quality of telephone service and availability of lines in Britain had diminished. BT's gross had been decreasing steadily since 1977, whereas the profits of similar services in other European countries had been flat or positive. On top of this bad news, SRI learned that because BT had begun the transition to digital switches, its capital costs had risen 30 % over the previous 2 years. DTI leaders were concerned at the reported state of their flagship enterprise where, on a comparative basis, BT was losing value.

The privatization of BT continued, and by the end of 1984 just over half its ownership was sold to the public. The remaining part was sold in two halves, one in December 1991 and virtually all the remainder in 1993. The total cash returned to the British government from the BT transition was of the order of £15B.[LL] BT plc is now a worldwide telecommunications company with over 2 million shareholders.

As a final word on the effort in Britain, it should be noted that the template SRI and DTI employed for cellular evaluation became a pattern for other such transitions around the world.[33] The rapid and immense success of Vodafone also showed how much profit there was in cellular communications. Furthermore, the privatization of BT showed other countries that, not only was privatization possible, but doing so would generate a large windfall for the departments and governments involved. The investment bankers also became interested, given the large sums of money involved and the attractive underwriting fees. Between 1984 and 1999 about $244B of state-owned telecommunications systems, worldwide, were privatized, involving 90 of the 189 members of the International Telecommunications Union.[MM]

profitable. The gentleman's name was Chris Gent, the current chairman of Vodafone.

[33] Many countries closely followed the British template including Australia, Belgium, Brazil, Canada, Colombia, Commonwealth of Independent States, Denmark, France, Germany, Hong Kong, Hungary, India, Ireland, Italy, Jordan, Mexico, New Zealand, Norway, Poland, South Korea, Spain, Sweden, Thailand, and Venezuela.

Domestic U.S. Economic Development Assistance

City of Austin, TX—Creating an Opportunity Economy

The choice of the catchy phrase, "Creating an Opportunity Economy" was deliberate on the part of analysts in SRI's Public Policy Center. In the spring of 1985, they had completed a landmark project that was to help transform Austin, Texas, into one of the country's leaders in the new information economy. While communities around the world have tried to mimic Silicon Valley's success, Austin is one of the relatively few that seriously embarked on such a transition, and one of the very few that succeeded in doing so.

The SRI study began in the summer of 1984 as an examination, sponsored by the city's Chamber of Commerce, of the economic outlook for Austin. But as stated by the sponsors in the foreword to SRI's final report:[NN]

> "What began as a largely traditional look at economic development for Austin ends not with a simple prescription for jobs. Rather, SRI International has taken us right to the heart of this community, Austin's people, all of its people."

The study was to look 15 to 20 years into the future and, as it turned out, the SRI group came to share in the excitement of the changes foreseen for Austin and helped provide the necessary stimulus to amplify that momentum.

The SRI team, led by Ted Lyman,[34] entered the project with the comprehensive objective of developing "a long-range strategy that builds on community strengths and aims at broad-based economic and community development." Loosely, what they found was a stable employment base stemming from Austin's being the Texas state capital, a source of educated talent as the site of the University of Texas, and an influx of technology companies that began in the 1960s with IBM and Texas Instruments and continued into the 1970s with Motorola and Advanced Micro Devices. This technology presence received a significant vote of confidence in 1983 when the nation's first private-sector R&D consortium, Microelectronics and Computer Technology Corporation (MCC) chose Austin as its headquarters in a competition with 57 other cities.[35] Austin's success in winning this competition and the critical collaboration between the Governor of Texas, the University of Texas, and local business leaders, also persuaded 3M Corporation to move five of its divisions, including its R&D operations,[OO] from Minnesota to Austin in 1984.

Another important factor was the increase in population in Austin and the surrounding area. Building permit issuance for residences grew nearly 11% in 1982 and was even higher from 1983 to 1984. These dramatic changes were prompting local planning offices to forecast population increases of more than 50% between 1985 and 2000. As can be seen in Figure 15-9,[PP] such estimates proved to be conservative. Along with population growth were positive changes in household income; 1982 data indicated that Austin had fewer low-income households and a vastly higher percent of upper income households than national averages. For households making more than $35,000, Austin had more than twice the national average—31% versus 13%. These remarkable changes were certainly cause for an examination of what lay ahead, as were less favorable economic trends in Texas that lay behind the positive statistics.

Oil prices were falling and with them the general Texas economy. The rising non-farm employment of the Austin area would flatten out, as is also evident in Figure 15-9. But it was the arrival of MCC that prompted local leaders to ponder the future of Austin's economy and to approach SRI to help develop the city's first long-range economic plan since 1957.[36]

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[34] Other members of the team were Tom Chmura, Jim Gollub, Doug Henton, John Melville, Paul Shay, and the Center Director, Steve Waldhorn.

[35] Austin's winning of MCC was good evidence of the benefits of working collaboratively. A $25 million laboratory facility, financed by University of Texas and private funds, was built at the University research center and leased to MCC at a nominal cost. Thirty-two endowed chairs of $1 million each were established, and MCC employees received fellowships, teaching positions, subsidized home loans, and other benefits. (Susan E. Engelking, *Austin's Opportunity Economy: A Model for Collaborative Technology Development*, Annals of the New York Academy of Sciences, April 1996.)

[36] SRI won the project competitively, assisted by its reputation for insightful economic analysis and strategic planning, and by a visit to SRI by a group of Austin business

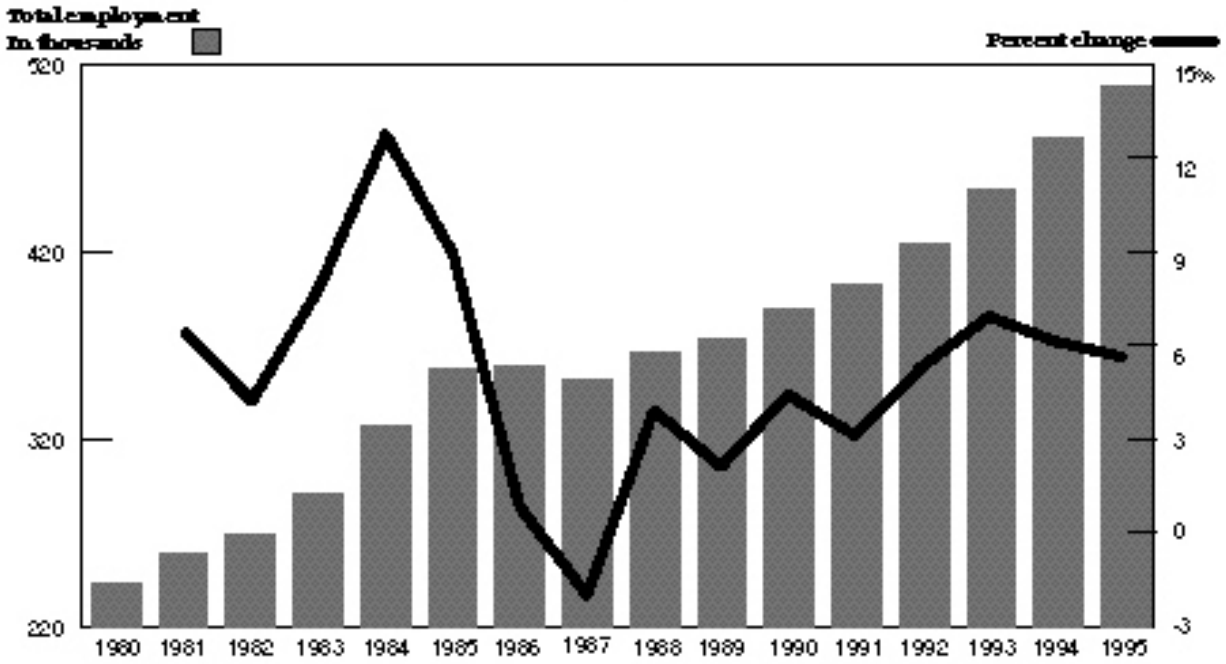

Figure 15-9. Nonfarm employment in the Austin, TX, metropolitan area (Texas Employment Commission and John Sharp, comptroller of Public Accounts).

The SRI investigators found an Austin area industrial transition under way but within the context of a continuing statewide economic malaise already in its fourth year. This combination would, in retrospect, provide a propitious time for a look at the future.

SRI's first step was to create a socioeconomic profile of the greater Austin area, including demographics and the major sectors of its economy. For demographics, SRI determined where new housing was being sought and how the reactions of the various zoning agencies would modulate that demand. Five economic sectors were chosen for analysis:

- R&D (creating new knowledge)
- Technology manufacturing (translating new knowledge into products)
- Technology-based information (software, telecommunications, etc.)
- Government services
- Support services.

SRI examined each sector to learn where recent employment growth had occurred and where it was projected to grow. These assessments were critical to developing a future strategy, and these five sectors would become the framework for recommendations to follow.

To give the Austin leadership a perspective about what lay ahead, the SRI team posited two possible futures: The first, called "Muddling Through," found the community, instead of pursuing a diversified economy, a new infrastructure, and the technical education of its future employees, slipping into complacency that allowed local industry to purchase goods and services outside the community rather than locally. The other scenario was essentially the antithesis:

- A diversified economy to weather business cycles
- Locally trained workers, as opposed to imported talent
- Planned investment in infrastructure
- A sufficient and rich diversity of local suppliers
- Maintenance of the public-private partnership that had been working.

Some of the first conclusions that SRI drew were that Austin was no longer dominated by the stable and predictable employment flowing from the University and the state government. The city was, in fact, now more subject to external changes, and those changes were of concern to the average citizen in regard to whether the current quality of life would continue or become vulnerable. That same quality of life, SRI suggested, was an important

leaders who happened to be in Silicon Valley luring firms to Austin.

ingredient in continuing to attract high-technology companies. Another finding was that increasing employment in just the service or support sector did not produce monetary growth and would therefore not be effective over the long term. Only the export of goods could do that. More specifically, SRI suggested that Austin could distinguish itself over the next 15-20 years by creating an advanced information and knowledge economy, and indicated what should happen in each of the economic sectors listed above.

SRI also included an action plan as part of the final report. This plan concerned two major and complementary areas: economic development and quality of life, with specific recommendations concerning:

- Economic growth and diversification
- Education and training
- Physical infrastructure
- Amenities and quality of life.

In addition, recommended roles for each of the major leadership constituencies in Austin—business leadership, local government, educational institutions, and community groups—were also indicated.

One of SRI's most important insights was that, because of the type of economy Austin was building, an inherent linkage existed between its continued economic progress and its quality of life. First-rate education and training, improved social, cultural, and recreational amenities, and a up-to-date physical infrastructure would be critical to attracting the kind of industry and people that would help avoid a "two-tiered" economy of well-paid "knowledge workers" and the rest of the workforce. Emphasis remained, however, on continuing the collaborative actions of the community's major leadership constituents and the state. Let's see what unfolded.

Through the collaborative efforts of all players, SEMATECH settled in Austin in 1988. Created from a federal government/U.S. industry partnership to battle the Japanese dominance of the semiconductor industry, SEMATECH was, like MCC, another one-of-a-kind collaboration and highly sought after. Its choice of Austin over several competing cities was another plum for the community, and allowed the city to profit from exposure to the many companies that made up both the SEMATECH and MCC consortia.

Also by the late 1980s, a critical mass of commercial R&D organizations was at work in Austin. In addition to the University, SEMATECH, and MCC, applied research was going on at Motorola, IBM, 3M, Radian, and other firms.

As an aid to entrepreneurship, Austin Ventures was formed in 1983, and the University formed the Austin Technology Incubator (ATI) in 1988, to which the Chamber of Commerce donated $25,000 a year. Michael Dell started his computer company in 1982 while a freshman at the University, and it has grown into a $35 billion corporation. In 1988, *Inc.* magazine named Austin the number one entrepreneurial city in the United States, based on the number of new companies being created. By 1996, the number of technology-based companies in the Austin area exceeded 900, and by 1999 the Austin area was second only to San Jose in the level of venture capital funding.[QQ]

Behind all the high-technology growth lie the SRI recommendations for a program of metropolitan consensus-building. Evidence of the importance of that philosophy is cited in a paper written at the University of Texas:

> "…several studies of the Austin area have confirmed the importance of public/private networking to the region and its specific incarnation of the new economy.
>
> An important study of this time emerged in 1985. Conducted by Stanford Research Institute International (SRI) [sic], the report provided a road map for the Greater Austin Chamber of Commerce. The report recommended that Austin create new networking organizations to 'bring about community consensus on key issues.'… Building on the momentum of the SRI report of 1985, the Austin Chamber commissioned a similar goal-setting study entitled *Next Century Economy* in 1998."[RR]

Indeed, SRI came upon an environment that had both a growing technology sector as well as an emerging process of collaboration between the government, the university, and private enterprise. SRI recognized the value of what had begun and helped formalize the collaborating, consensus-building process that it found. The Austin leaders did this so well that

Austin became perhaps the fastest growing high-technology center in the U.S. But SRI also prominently positioned the area's concern for quality of life, including not only cultural and social needs but a desire for growth without the burden of the high cost of living so evident in Silicon Valley.[37] In the years since SRI's 1985 study, "quality of life" indicators have become a significant measure used by communities across the country to attract technology-intensive industry.

New Seeds for Nebraska and Iowa

A second SRI economic development study—this time at the state level—was for Nebraska. In contrast to the existing, focused technology momentum of Austin, the population of this agricultural state had a much wider span of interests, and the need for economic restructuring was also much greater. In spite of the dominance of agriculture, the consensus was to find ways to insulate Nebraska's economy from the diminishing demand for agricultural products and declining government subsidies. Not only was the State's economy tied too tightly to basic agricultural commodities, the State's population growth rate was declining as its young people left for more promising opportunities in other states.[38] Thus, SRI faced a conceptually more difficult problem, when it was retained in 1987 by a group of prominent business leaders from across the state with money provided by Omaha's Peter Kiewit Foundation.[39]

Given the state's population diversity and distributed rural component, SRI's first task was to gain a sense of what was important across the state. It was easy to see that as farming became more efficient, the number of farmers needed would decline, as would the economies of the small farm-supported towns that dotted the countryside. And that small-town economy was important, for at the time Nebraska had about 600 cities of less than 5,000 people each. The only population or economic growth was occurring in the two major cities, Omaha and Lincoln, but much of that growth was in services, a narrowly based economic sector insofar as overall state growth was concerned. By conducting more than 100 interviews across Nebraska, SRI compiled an interim report that assessed the situation, conveyed the spectrum of opinion, drew preliminary conclusions, and posed a range of economic development strategies.

Even in this interim point of the project, however, SRI was forced to arrive at a rather stark conclusion:

> "Nebraska can elect to work hard but defensively at maintaining the narrow focus of its economy, slowly diversifying but remaining largely at the mercy of outside forces. Or it can choose to build a broader, more diversified economy for itself…. SRI believes that Nebraska has only one feasible choice: make the most out of agriculture but also develop its services and manufacturing sectors in a concerted way."[SS]

This broadly based information gathering process was a necessary preamble to focus the state's business, government, and community leaders' attention on the same information. The next step, then, was to share this conclusion with the state's people to obtain their opinions about what directions were most promising and acceptable.

To get the word out, more than a half million copies of the summary report were distributed as a Sunday newspaper supplement in every paper across the state in the spring of 1989.[TT] This information then became the basis for countless town meetings and community discussions. SRI team members participated in a large share of these meetings in discussions about the generalized costs and benefits associated with new accessible technology, the statewide infrastructure required, greater entrepreneurship and innovation, and the increased need for skilled and adaptable people.

With SRI's report, the forceful leadership of the governor, and the general consensus developed through the town hall meetings, leaders began to implement an array of public policy reforms at the state and local levels designed to begin Nebraska's economic shift from commodity agriculture to a more diversified economy. Examples included new institutional economic development mechanisms, a Food Processing Institute at the

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[37] Austin's cost of living is considerably cheaper than that of other major American cities—about even with second-tier cities such as Portland, Salt Lake City, and Denver. (*Cost of Living Index – comparison of major U.S. cities*, taken from www.ACCRA.org, June 2001.)

[38] The State's growth rate in the 1980s was 40% lower than it had been in the 1960s.

[39] The Nebraska Press Association was the administrative "home" for the project.

University of Nebraska, Lincoln, and an insurance industry technology center in Omaha. Leaders of "second-tier" centers in central and western Nebraska began focusing economic development efforts not on attracting new retailers but on building up the supply base for an emerging manufacturing sector.

While Nebraska remains one of the country's leading agricultural centers, manufacturing and information-intensive services (e.g., telecommunications, insurance) have grown to give the state's economy better balance than was the case before SRI's suggested strategies for economic diversification.

In the same vein, but considerably later, SRI addressed the state of the State of Iowa. In 1999, SRI conducted a similar economic analysis and made suggestions about what might constitute a more favorable economic future of Iowa. Like Nebraska, the average age of agricultural workers in the State was increasing as younger people left for more lucrative jobs elsewhere. The study looked at existing enterprises and the talent pool coming from the universities. SRI concluded that Iowa offered opportunities for attracting companies or home-basing of new ones in three areas: life sciences, advanced manufacturing, and information technology. Like the Nebraska work, the study motivated interest; however, in this case, the depressed fiscal situation left even those who wished to make such investments wondering if they could be afforded. In January 2003, Iowa's governor proposed to the legislature the creation of a $500 million state development fund.[UU] Biopharmaceutical companies are among those the state is trying to woo, but it's too early to know what is likely to transpire.

Endnotes

[A] The Ford Foundation, *Development of Small Scale Industries of India—Prospects, Problems, and Policies*, Report of the International Perspective Planning Team to the Indian Minister of Industry, July 1963.

[B] As a case in point, see www.thanjavurcity.com/sisi.htm for a government small business organization, but also an associated academy for software and information technology development.

[C] S. Nanjundan, H.E. Robison, and Eugene Staley, *Economic Research for Small Industry Developmen*t. Asia Publishing House, Bombay, 1962. (Also a part of a large set of SRI reports on small industry.) Two other related books resulting from this work are: Eugene Staley and Richard Morse, *Modern Small Industry for Developing Countries*, McGraw-Hill, New York, 1965; and Robert W. Davenport, *Financing the Small Manufacturer in Developing Countries*, McGraw-Hill, New York, 1967.

[D] "The Story of SRI—20 Years," *SRI Journal*, Feature Issue 4, December 1966, p. 21.

[E] The Ford Foundation, "Development of Small Scale Industries of India—Prospects, Problems, and Policies," Report of the International Perspective Planning Team to the Indian Minister of Industry, July 1963.

[F] A good summary of SRI's contributions in India is put forward in the *SRI Journal*, Vol. 4, Second Quarter, 39-76, 1960; and *SRI International Journal*, No. 47, 1981.

[G] Some of this account of the SRI planning and advisory work for Saudi Arabia was taken from a 1986 internal International Project History by Gordon Parker.

[H] Peter Duncan, personal communication, October 29, 2002.

[I] Gordon Parker, op. cit.

[J] *A Report on Projections for the Manufacturing Sector for the First Five Year Plan*, SRI Project 8464, January 26, 1970-July 31, 1971.

[K] Data taken from www.saudiembassy.net.

[L] Willard D. Weise, *Short-Term Assignment for Road Planning*, Project 8464 for the Central Planning Office, March 26, 1970.

[M] James A. Harsch, *Management Assistance for Reorganization of the Ministry of Planning of the Kingdom of Saudi Arabia*, SRI Project 4600-20, Central Planning Office, April 28, 1976.

[N] *SRI Research for Industry*, 11(6), November-December 1959.

[O] George Hagn, one of the participants, personal communication, December 11, 2002.

[P] Robert F. Daly, Lloyd I. Krause, Dieter Lohr, and Lawrence R. Rojahn, *Future Directions for*

Tele-Information in Iran, SRI Final Report, Project 4410, Iran–Minister of State, August 1975.

[Q] Weldon B. Gibson, "The Story of SRI," *SRI Journal*, Feature Issue No. 4, 22, December 1966.

[R] *Executive Summary , Building Prosperity: Five-Part Economic Strategy for Hong Kong's Future,* SRI Project 6222, September 1989.

[S] William F. Miller, personal communication, May 10, 2004.

[T] *Business Week*, December 9, 2002, pp. 50-58.

[U] *SRI Journal*, No. 7, pp. 8-11, November 1965.

[V] Philip Daniel, *Africanization, Nationalization and Inequality: Mining Labor and the Copperbelt in Zambian Development*, Cambridge University Press, London, 1979. Quoted at www.american.edu/projects/mandala/TED/zamicopp.htm.

[W] *Wall Street Journal*, July 13, 1982 and interviews with Tom Boyce, April 25, 2001 and Bill Schumacher on May 4, 2001. Both these gentlemen were project leaders in the two large SRI projects in Zambia.

[X] Ravi Gulhati, *Impasse in Zambia—The Economics and Politics of Reform, Economic Development Institute of the World Bank*, Report No. 8078, July 1989.

[Y] Gulhati, op. cit.

[Z] Gulhati, op. cit.

[AA] The early SRI Zambian project numbers for assessment and revamping were 5500, 6066, 6611, 6900, 7800, and 8779. The training projects were 4047, 5900, and 7357. The later privatization projects in the early 1990s were 1376, 2317, 4300, 4308, and 9701.

[BB] Gulhati, op. cit.

[CC] Roy Price, personal communication, May 9, 2002. Price contributed to some of ZCCM's materials management reforms.

[DD] *African Business*, December 1997.

[EE] CIA*, World Fact Book 2002* (www.cia.gov./cia/publications/factbook/geos/za.html)

[FF] See Chapter 14 on business consulting and development.

[GG] Peter Boone and John Mathieson, *Intellectual Property Rights: Assessment of Current Policies, Practices, and Options for AID Initiatives*, Final Report on Project P0 8331, USAID Contract PDC-0091-C-00 9092-00, December 1990. Report deals with the general question of intellectual property protection in developing countries.

[HH] Estefania S. Ermita, "Adjudication still Problematic," *Manila Bulletin*, Monday, February 28, 1994. The SRI study was led by international economists Peter Boone and Ophelia Yeung, with the participation of Philippine consultants Rico Domingo and Carlo Carag.

[II] Catherine P Ailes, H. Roberts Coward, Robert C. Dauffenbach, and Joel L. Barries, *Forecasting Malaysia's Science and Technology Human Resources and Research and Development Investment Needs Leading to the Year 2020*, Final Report, Project P1819, February 1997.

[JJ] This section, compiled with the assistance of Charles Mason (January 2001), Robert Perrin (March 2001), and Dan Allan (March 2001), is a corrected version from the first printing, thanks to the efforts of Robert Perrin (June 2006).

[KK] *Businessweek,* January 25, 1999.

[LL] Calson Analytics note on telecomm privatization: www.calson.com.au/privatisationnote1.htm, 7 July 2006.

[MM] Endnote LL, op. cit.

[NN] SRI International, *Creating an Opportunity EconomyEnhancing Quality of Life in a Changing Community,* SRI Final Report for the Austin Chamber of Commerce, April 1985.

[OO] The Greater Austin Chamber of Commerce, *Austin's Evolution—University Town to High Tech Center*, May 2001.

[PP] Carole Keeton Ryland (Texas Comptroller of Public Accounts), "Austin-San Marcos Metropolitan Area Profile," in *The Texas Economy* and at www.window.state.tx.us/ecodata/regional/capital/capasmsa.html, May 2001.

[QQ] Engelking, (Footnote 36) op. cit.

[RR] Samuel Paul Jacobs, *Networks of Public/Private Cooperation for Economic Development: The Case of Austin, Texas 1983-1999,* TC 660H,

Plan II Honors Program, University of Texas, May 3, 2000. (The next assessment for Austin was performed by ICF Consulting, which is made up of former SRI employees. In a project also led by Ted Lyman, the award was an indication of Austin's confidence in SRI's earlier work.)

[SS] SRI International, *New Seeds for Nebraska–Strategies for Building the Next Economy*, SRI Summary Report, 1987.

[TT] *New Seeds for* Nebraska, op. cit.

[UU] "A new Iowa vision," *Omaha World-Herald*, January 31, 2003. The article cites the SRI impetus.