

LOUISIANA WORKS!
Workplace and Marketplace Innovation from Louisiana's
Award-Winning Entrepreneurs

by

Edward J. O'Boyle, Ph.D.
Mayo Research Institute

January 2012

Revised: February 2020

Questions and comments should be directed to:
Edward J. O'Boyle, Ph.D.
Mayo Research Institute
1217 Dean Chapel Road, West Monroe, LA 71291 USA
edoboyle737@gmail.com
www.mayoresearch.org

In 1983 the United States Senate authorized an award to support and recognize private firms which had taken steps to promote productivity and improve quality in whatever product or service they produce, thereby contributing to better customer service, greater profitability, and more and better job opportunities. The two U. S. Senators from Louisiana at that time, Russell Long and J. Bennett Johnston, appointed a small board of Louisianians to establish a process in the State to select and to recommend a suitable recipient company. Beginning in 1984 the U. S. Senate Productivity Award was presented every year to the Louisiana company with the best recent record of quality and productivity improvement. The last year in which the Award was made was 1995.

In brief, the selection process involved inviting, receiving, and evaluating written applications from companies in Louisiana and selecting usually three or four firms every year as finalists to be visited by a small team made up of members of the Board. A written report was prepared for each site visit and those reports were used as the basis for the Board's recommendation of one firm to receive the Award. The Board members were especially interested in the specific steps which the company has taken to attack waste in the production process and to lower the unit cost of production.

In 1988, quite serendipitously, the Board discovered in visiting one of the finalists that certain especially noteworthy innovations had been implemented successfully which did not fall within the scope of the Productivity Award. For that reason, the Board recommended the establishment of a second award which from the very beginning was called the U.S. Senate Innovation Award. The Board members were especially interested in financially successful achievements in the marketplace which had the effect of putting the company on the leading-edge in its industry. The last year in which this Award was presented was 1993.

The two Awards were complementary in the sense that the Productivity Award was inward-looking, focusing on achievements in the workplace whereas the Innovation Award was outward-looking, highlighting accomplishments in the marketplace. The same process was used in selecting a suitable recipient for the Innovation Award and, as with the Productivity Award, the Board's recommendations were accepted without exception. For both Awards the only tangible prize presented to the winning company was a simple bronze medallion. The 18 winning firms are listed below.

THE AWARD-WINNING LOUISIANA COMPANIES

United States Senate Productivity Award:

1984 General Electric	1985 Martin Marietta
1986 Bollinger Machine Shop & Shipyard	1987 AT&T
1988 Stone Container	1989 Stuller Settings
1990 Amerchol	1991 Textron Marine
1992 Cameco Industries	1993 Thibodaux Hospital
1994 Harmony Corporation	1995 Temple-Inland

United States Senate Innovation Award:

1988 Terrebonne General Medical Center	1989 John E. Chance & Associates
1990 Edison Chouest Offshore	1991 Acadian Ambulance
1992 Louisiana Offshore Oil Port	1993 Wemco

All of the costs incurred by the Board members were absorbed by their companies. Thus, no one on the Board was paid or re-imbursed by federal funds for his/her participation in the selection process.

Of the various objectives which were to be achieved through the establishment of the U.S. Senate Productivity Award in 1983, the one which proved to be the most difficult was the transferring of effective programs of productivity improvement from the companies in Louisiana which had success in their implementation to other firms in the State which were in need of some assistance in dealing with problems of sluggish productivity.

With this in mind, at the end of the first year in which this Award was presented in Louisiana (1984), a decision was made to enlarge the Selection Board by inviting the principal senior manager from the Award-winning firm to serve on the Board. The interaction between senior managers on the Board and senior managers of the firms competing for the Award which took place at the time of the site visit was an outstanding success but the transferal was along lines which were not initially intended by the Award: from one set of successful companies to another rather than from companies with a record of success in tackling productivity problems to ones with unsettled productivity issues. Further, this transferal benefited only a small number of persons and companies.

LOUISIANA WORKS! presents shortened accounts of the successful programs implemented by the 18 firms which from the more than 50 finalist companies were designated recipients of the

Productivity Award or the Innovation Award. These accounts were prepared originally in the present tense, and have not been changed in order to emphasize that they were drafted and revised shortly after the completion of the site visit.

The 18 Award-winning firms are grouped as follows: health care, shipbuilding, crude oil, light manufacturing, construction and lumber, and heavy manufacturing. In each case, the specific details refer to conditions and activities which took place many years ago. Even so, the author's final remarks are intended to draw certain lessons from the experiences of these firms which have more general applicability even years later. See Appendix A for a description of the selection process, a listing of the critical factors which were use to select a suitable recipient company for both Awards, and the persons who served on the Board throughout its lifetime. See Appendix for a listing of all 51 companies that Board members visited from 1984 through 1995.

HEALTH CARE ENTREPRENEURS

Three Award-winning health-care organizations are included in this section. Two of the three are publicly-owned community hospitals. The third is a private proprietary provider of emergency medical services. Terrebonne General Medical Center was the first recipient of the U.S. Senate Innovation Award. Indeed, a site visit by the Selection Board to this hospital in 1988 when it had applied for the Productivity Award persuaded the Board members to initiate a second award. Three years later, Acadian Ambulance was named to receive the Innovation Award. Thibodaux Hospital and Health Centers was chosen by the Selection Board for the 1993 Productivity Award. Coincidentally, the two hospitals are located in adjacent parishes (counties) and view one another as competitors.

A brief comment about marketplace innovation and quality/productivity is appropriate. To be eligible for the Innovation Award, a company had to demonstrate marketplace success with a new product or service. The Board never put in place specific criteria of marketplace success (e.g., return on investment) to express this norm of eligibility in measurable form. A judgement was made in this matter at the time the finalists were selected from the pool of applicant firms and again, after the site visit, when the Selection Board recommended the Award recipient. What mattered most was the ability of experienced senior managers to recognize marketplace success once the basic information was presented to them.

Quality was defined as the number of defective units per given amount of output, and productivity was specified as unit cost or units of output per fixed amount of input. In the workplace, quality and productivity no longer were seen as mutually exclusive objectives: whatever steps were taken to enhance the one need not have a negative impact on the other. Indeed, more and more, productivity was seen as a function of quality. Quality improvement

actually drives productivity enhancement and that one important way to remain competitive in the marketplace is by reducing the number of defects to zero not through re-working defective units but by doing the job right the first time. Productivity climbs because re-work is eliminated. Statistical process control and statistical quality control are used to track performance. This linkage is referred to more than once in the company reports which follow.

Cardiac Care Partnership: Terrebonne General Medical Center¹

Terrebonne General Medical Center (TGMC) is one of four hospitals operating in Terrebonne Parish. At one time, TGMC was a Parish hospital leased to a Catholic order of sisters. Later it was established by a public hospital service district and today, even though some vestiges of its Catholic origins remain, TGMC is a public hospital. Even so, TGMC does not receive local tax funds for operating expenses or for capital improvements. In the mid-1980s, TGMC began penetrating a new market by introducing certain leading-edge cardiovascular services which at that time were available only at university medical centers.

TGMC services the tri-parish region of Terrebonne, LaFourche, and St. Mary Parishes which has a combined population of 230,000. The City of Houma, where TGMC is located, has a population of 45,000. TGMC employs no physicians directly; the emergency room is covered through a contractual arrangement. The hospital is health-needs oriented and participates in Sun Health which is a hospital alliance offering among other services group-purchasing.

According to its acuity index, TGMC admits patients who in general are acutely sick. Its occupancy rate and admissions-to-beds rate have been increasing. At the same time, staffing has increased which in turn has raised the staff-to-patient ratio over the past several years by 0.8 full-time equivalents. These increases reflect substantial improvements over the past several years in the scope and quality of cardiac care brought about by the Cardiovascular Institute of the South (CIS) -- a group of cardiologists and cardiovascular surgeons in private practice in Houma who admit patients to TGMC.

The hospital claims that its acuity index has been rising faster than its staff/patient ratio which indicates that it is accommodating more acutely sick patients in part by using their staff more efficiently. Quality assurance is measured in terms of the number of patients readmitted to surgery within 30 days, general readmissions, outpatients admitted after outpatient surgery, medication errors, patient falls per patient days, dietary errors, patient complaints, employee injuries per patient days, and other metrics.

¹ From a site visit to the hospital in Houma, Louisiana in 1988.

At the time of the site visit, there had been more than 400 open-heart surgeries performed at TGMC, all involving adults. The overall mortality is 1.0 to 3.0 percentage points below the mortality rate for by-pass surgeries. The reason for the lower mortality is the frequent use of leading-edge technology -- laser angioplasty, atherectomy, and stents. The cardiac care is provided by six cardiologists and two cardiovascular surgeons who are associated with CIS.

Many cardiac-care units across the United States in 1988 were utilizing laser angioplasty (a laser-tipped probe which is inserted through the artery to vaporize a blockage), atherectomy (an instrument with tiny rotating blades which scrap away and suction off the blockage), or stents (a stainless steel mesh which is left in the artery to prevent it from closing and blocking). At that time, however, TGMC was the only cardiac-care unit in the United States which used all three. Some of the CIS physicians grew up in the Terrebonne Parish area, left for their medical education and specialist training, and returned because they prefer living there. Others have been attracted by the opportunities to be on the cutting edge in the field of cardiac care.

This type of care normally would be available only at a university medical center. However, because the local area is well known for a very high incidence of cardiovascular disease attributable importantly to the smoking, drinking, and eating habits of the area residents, there is a strong need for it to be located close at hand so that patients and their families from the area are not required to travel to a university medical center in New Orleans which is about 60 miles from Houma.

The large population with cardiovascular disease or at risk affords CIS/TGMC physicians special opportunities to apply new procedures to a large number of cases, to become highly skilled in these procedures, and to draw conclusions as to their efficacy with greater confidence. TGMC accepts referrals from outside the local area and from outside Louisiana and they provide continuing medical education opportunities to cardiac-care specialists from outside the area, including other parts of the United States and foreign countries. While other physicians were performing laser angioplasty in peripheral arteries, CIS physicians were the only ones in the area doing laser angioplasty in the coronary arteries. Further, at the time of the site visit they were planning to begin using laser angioplasty on coronary arteries during open-heart surgery as a substitute for or as a complement to by-pass surgery.

It is not unusual for a hospital to enter either a formal or informal partnership with a single physician or group of physicians. However, the cardiac-care partnership at TGMC is unique in Louisiana and very special in the United States because it provides leading-edge services which otherwise are available only at a university medical center and for that reason is able to provide that care at a lower cost.

The continuing medical education which has been provided and is planned for the future indicates that the technology already is being transferred not just outside Louisiana but outside the U.S. Quality in cardiac care at TGMC generally appears to be extremely high. None of these achievements in cardiac care would have been possible without the partner relationship which has developed between Terrebonne General Medical Center and the Cardiovascular Institute of the South.

Clearly, the innovating of leading-edge cardiovascular services into a community hospital is driven by the competitive organizing principle and the masculine gender trait. At the same time, this innovation would not have been possible without the energy drawn from the cooperation between the hospital on the one hand and the cardiac-care group on the other, along with the feminine gender trait. This innovation underscores the need for blending and balancing these difficult-to-mobilize organizing principles and gender traits.

One principle of economic justice especially appears to operate beneath the surface supplying additional organizational energy. Contributive justice seems to be a significant motivator for those CIS physicians who grew up in the Terrebonne Parish area, left for their education and training, and returned home to practice medicine.

Finally, providing leading-edge cardiovascular services at prices below what university medical centers charge is consistent with a heightened sense of community -- the social value upon which the organizing principle of cooperation rests.

Cooperative Delivery of Emergency Medical Services: Acadian Ambulance¹

Acadian Ambulance (AA) is a privately-held, for-profit company which has innovated a delivery system that energetically marshals and critically depends on resources from a variety of public and private institutions to provide affordable and professional emergency medical care to an area of service where many of the residents live in small towns or in rural precincts. The delivery system is AA's innovation. AA began operating in 1971 at a time when ambulance services were characterized as "scoop and run." At that time, new federal regulations created a crisis in the area because private providers (many were funeral directors) were unable or unwilling to continue operating. The city and parish (county) public officials were hard pressed to add ambulance services as a public service supported by public funds. Today, AA is the largest private ambulance service in the United States providing state-of-the-art emergency medical services in a predominantly rural 22-parish area which covers 14,610 square miles. It has more than 700

¹ From site visits to the company's headquarters in Lafayette, Louisiana in 1991 and 1992.

employees, 100 ground vehicles, 3 helicopters, and 1 fixed-wing airplane. AA staffs 38 stations in its service area and 9 offshore medical platforms. In 1991 it served nearly 150,000 patients and its ground vehicles rolled up 5.1 million miles.¹

AA was started by three young men using as their model a private ambulance company in the Pennsylvania hometown of one of the principals and enlisting the support of local public officials, a local bank, television and radio stations, and a newspaper to sell annual memberships. Public officials were instrumental in persuading the television and radio stations to allow AA free broadcast time to conduct a telethon to reach the public. The telethon has become an annual affair, but the broadcast time no longer is free. In addition, public officials persuaded a local bank to provide financing and to help collect the annual membership fees. That practice continues today with 80-90 banks and more than 300 collection points in AA's area of service. Throughout its entire history, these three men have provided the principal senior-management skills.

From the very beginning, AA has represented itself as a public service and, it seems, in the eyes of the public is perceived as a partner with the police and fire departments in providing reliable and trustworthy emergency services. AA has cultivated that image in a variety of ways. For example, the company details free of charge an emergency ground vehicle at athletic events and various fairs and festivals in its area of service. AA knows how to use the media to tell its story to the public and to highlight significant company and individual employee accomplishments. AA's principals claim that the company provides state-of-the-art, not leading-edge, emergency medical services. Even so, AA is innovational in the sense that the senior management has innovated an organization that delivers services which are perceived as a public service even though the company is privately-held, for-profit.² Its books are open to examination by public officials in its service area and in that regard AA is similar to an investor-owned public utility.

The delivery system, however, is much larger than AA alone. AA depends critically on resources and support supplied by other organizations and agencies -- some public, some private -- to deliver emergency and convalescent medical transportation services. To enumerate, it depends on area banks to collect its annual membership fees. AA has persuaded public officials and medical societies in cities and parishes in its service area to accept and promote AA as a public service provided by skilled and caring professionals. Three parishes have contracted directly

¹ By September 1994, AA had 1,000 employees, 145 ground units, 3 helicopters, and 2 fixed-wing airplanes. The company staffed 63 stations including 23 oil and gas exploration and production sites in the Gulf of Mexico. In 1993, AA served approximately 200,000 patients and its ground vehicles tallied about 6,000,000 miles per year.

² In 1993 AA started an ESOP for its workforce.

with AA to supply ambulance services to all parish residents.

AA has worked closely with one state university in developing and funding associate degree courses to train emergency medical technician-paramedics and with the medical school at another state university to supply emergency medicine residents to enhance the quality of care on its ambulance helicopters. Through a lease agreement with a local helicopter service company, AA is able to use a small fleet of dedicated and specially-equipped helicopters with no direct responsibility for servicing and maintaining that fleet. AA does not bear the entire burden of the cost of leasing the helicopters. Five area hospitals provide funds which make this service available. One helicopter is stationed at and dispatched from each of the metropolitan areas AA serves.

AA is an example of feminine-type entrepreneurship focused mainly on the workplace and driven chiefly by the organizing principle of cooperation.

Resuscitating a Comatose Hospital: Thibodaux Hospital and Health Centers¹

Thibodaux Hospital and Health Centers (TH) in 1989 was a “plain vanilla”² facility which had been encountering difficulty in meeting local health care needs largely because it was not competitive. In the early 1990s, TH set in motion a major organizational overhaul.

TH traces its origins to St. Joseph Hospital which was established in January 1930. Twenty-three years later it was replaced by new construction at a different site and in 1967 it was purchased by the LaFourche Parish Police Jury. The present facility was opened in 1975 and was renamed Thibodaux Hospital and Health Centers in 1989.

In June 1990 the Board of Commissioners hired a management consulting firm to administer TH for a fixed fee. That firm presently manages some 261 hospitals in the United States. At TH only two persons are employees of the consulting firm; everyone else is a TH employee.

The new TH management team began immediately to develop a strategic plan which involved surveying the area population and physicians and re-defining the TH area of service. The planning period involved five-year projections based on the hospital operating as a secondary-care center. The planning process led to a decision to focus TH's resources on five specific areas or health centers: cardiology, oncology, neurosciences, women, and outpatients. A mission statement was developed, following by a vision statement, a values statement, and an operating

¹ From a site visit to the hospital in Thibodaux, Louisiana in 1994.

² The present chief executive officer's own words.

philosophy.

To develop the five health centers, TH began recruiting physicians according to the need in those five areas. At the same time, TH made several major new equipment purchases such as a state-of-the-art MRI which was especially critical in the recruitment of a neurologist and neurosurgeon and the newly-opened cath lab which was required in order to successfully develop the TH cardiology center. Cardiac-care physicians were recruited with the assistance of the Cardiovascular Institute of the South which began in the 1980s in Houma and which today provides physician services in a number of cities in south Louisiana. The TH chief executive officer described cardiology as creating a “halo effect” for the hospital because cardiac disease is a major problem in the TH area of service.

Major physical renovations were begun throughout the hospital to open a 17-bed physical rehabilitation center, for example, which is critical to the care of stroke patients (another major health problem in the area) and which subsequently has become fully accredited, a state-of-the-art women's center, and a Level II newborn intensive care unit. Other major renovations were made to patient rooms and nursing stations and comfortable waiting areas were opened for the first time on the upper floors of the facility. New construction provided some additional space to the existing building, notably to accommodate the MRI which has special construction requirements. All of the renovation and expansion was guided carefully by an interior design specialist and all of it, with the exception of the MRI, was financed entirely from cash reserves available at the start of the reorganization and from subsequent cash flow. Specifically, cash reserves increased by \$4 million at the same time that roughly \$10 million in improvements were being made.

In 1994 construction began on a separate building which is to provide some 12,000 square feet of space for the cancer center. This construction along with the purchase of the MRI were financed from a \$20 million revenue bond issue. TH has pursued informal linkages to M.D. Anderson Hospital in Houston, Texas to improve the oncology services available to local residents.

As a central part of the reorganization, the management team completed a master site plan. Recently TH acquired 3.5 acres adjacent to the campus which it needed to meet the requirements set forth in that plan. A major longer-term unmet need is physician office space to help accommodate recently recruited physician specialists and to provide a setting for future doctor recruitment.

Important savings were achieved beginning in November 1990 through the termination of a large number of employees who were regarded as redundant because of the long-term erosion of the hospital's daily patient census. By 1994, however, FTE employment was higher than before the

cut in 1990, with major additions in patient services which was necessary to reverse the decline in daily patient census. At the same time, major improvements have been made in the pension plan, employee awards and recognition, employee involvement in decisionmaking, and quality (continuous quality improvement).

Today, TH is a fully accredited secondary-care hospital. Net revenues, have climbed by 38 percent during the three fiscal years ending in 1993. By the end of FY 1992 some \$450,000 had been saved in the purchase of supplies, equipment, fees through volume discount buying. Other savings have been achieved through improved coding for Medicare/Medicaid reimbursement and a one-time inventory reduction.

The average daily census has been rising over the last two years. A similar trend was noted in admissions, even though on the national level admissions continue to fall. Average length of stay has not changed over the past five years and continues to be much lower than the national and the state averages. Gross patient revenue has increased by 120 percent in the past 5 years, due mainly to higher utilization rather than higher rates.

At same time, the TH acuity index (a measure of the condition of the patient on admission) was much higher in FY 1993 than three years earlier, which means that TH typically is admitting patients who are sicker or who are more seriously injured.

As to productivity, payroll cost as a percent of gross revenue has decreased from significantly from FY 1989 to FY 1993 and over the same period labor hours per (adjusted) patient day has fallen by approximately 5 hours. Improvements in payroll costs reflect important increases in gross revenues. Improvements in labor utilization reflect changes in monitoring utilization, cross training the staff, and reassigning personnel temporarily as needs change.

At the beginning of 1994, TH had begun acquiring a health information system which will merge administrative information and clinical information in a single patient record. Additionally, the system is designed to convert certain test results such as MRI from analog form to digital form in order to store in a single patient record, thereby allowing one point of access to all TH information on a patient.

Finally, TH has achieved major improvements in nursing services through changes in the compensation and benefits package, the use of productivity performance monitoring, the development of an automated scheduling system, the hiring of properly trained staff, and the involvement of employees in management decisionmaking. Two areas were especially important: the replacement of costly agency nurses and the use of continuous quality improvement for individual performance evaluation.

TH has successfully undertaken inward-looking innovation in the workplace where it is characteristically feminine and outward-looking innovation in the marketplace where it is distinctively masculine. The makeover at TH is a model for helping other community hospitals which are struggling to offer affordable, quality health care -- all matters of prime ethical concern under the principle of equivalence.

SHIPBUILDING ENTREPRENEURS

Three companies are in the shipbuilding business. Bollinger Machine Shop and Shipyard in Lockport innovated a change in the early to mid 1980s from custom-built “boat-trucks” for the offshore oil industry to production-run patrol boats for the U.S. Coast Guard. Edison Chouest Offshore in Galliano is unique among shipbuilding companies in the United States: it is the only one which builds customized offshore marine service vessels for charter only. Textron Marine and Land Systems operates a large facility in New Orleans which produces air cushion vehicles for the military and civilian market. At the time of the first site-visit, one of the Selection Board members who operates a shipyard asserted that Textron Marine and Land Systems is not a shipyard, it's an aerospace company.

From Custom Built to Production Run: Bollinger Machine Shop and Shipyard¹

Bollinger Machine Shop and Shipyard (BMS) is a small family-owned and managed shipyard in Lockport, Louisiana which began operations in 1940 mainly to build boats for the sugar transport trade. In 1952 it entered the off-shore oil-supply business producing customized 100'-150' boat-trucks. It continued in that market until 1981 when a sharp drop in the price of crude oil brought growth in the oil fields to a halt.

During the first 40 years of the company's growth and development, 90 percent of the work was done on a time and materials basis. Typically, work was performed for customers without bids and without contracts and most of BMS's customers were located within a thirty mile radius of the shipyard. Over this entire period, the company never borrowed money; growth and development were completely financed from retained earnings. In the early to mid 1980s BMS innovated an altogether new production process to switch from custom production for offshore oil producers to production-line manufacture of patrol boats for the U.S. Coast Guard.

Coinciding with the downturn in oil exploration and production in the early 1980s was the Reagan Administration's commitment to interdict drug traffic. A part of that commitment called

¹ From a site visit to the company shipyard in Lockport, Louisiana in 1987.

for the development, production, and deployment of a patrol boat which could chase a suspicious freighter fast enough so that it could not slip away after dark. Even though Bollinger's reputation and experience have been in the production of custom vessels with very heavy hulls (up to one-inch steel plate), the company's successful bid to produce a run of sixteen patrol boats for the Coast Guard was based on a much lighter hull (mostly one-eighth inch plate) and an aluminum super-structure. Production began in early fall 1984. Eventually, BMS built a total of 49 110' cutters for the Coast Guard.

Before the contract was let by the Coast Guard, BMS developed a situation manual which laid out the start-to-finish production task in 500 steps. Each step included detailed specifications of time and materials required. A central aspect of the work performed by the BMS production employees was hand welding of light-gauge steel and aluminum. To meet the requirements set forth in the contract, the welders had to be re-certified in order to establish their skills in a special welding process which BMS borrowed from its welding equipment supplier. BMS provided the equipment and welding suppliers provided assistance on special welding problems and their solution. The BMS senior management affirmed that it was not at all unusual for inter-firm cooperation of this sort especially at the level of production management and personnel.

The key to the construction of the hull is its modular design and the institution of numerical control plasma cutting to cut the detail parts to a "net" (no additional trim required) configuration. The modular design is unique to BMS. There are four main modules for the hull construction and two jigs are set up for each module. Crews are assigned to a specific jig and remain at that work station for the duration of the production run. The crews working on paired jigs are pitted against one another competitively in order to maintain work rates. BMS affirmed that this competitive division-of-labor moved their production personnel rapidly along the learning curve for the first fourteen boats.

Innovation at BMS has four distinct aspects: a new (for BMS) product, different materials, a new market, a different process of production. The company is both outward-looking toward the marketplace and inward-looking toward the workplace. It blends the operating principles of cooperation and competition, along with their associated gender traits of femininity and masculinity. The employee's strong work ethic and pride of workmanship reflect a personal commitment to the principle of equivalence and the principle of contributive justice.

*A Charter Service, Not a Shipyard: Edison Chouest Offshore*¹

Edison Chouest Offshore (EC) is a high-tech, family owned and operated business specializing

¹ From a site visit to the company's facilities in Galliano, Louisiana in 1991.

in the construction and charter of one-of-a-kind offshore marine service vessels. EC charters vessels of its own design, constructed in its wholly owned subsidiary for a variety of customers, such as the U.S. Navy, Johns Hopkins University's Applied Physics Laboratory, and Louisiana Offshore Oil Port. The company is the only shipyard in the United States which charters literally 100 percent of the vessels built in its shipyard.

The company began operations in the early 1960s with a father -- Edison -- and two sons -- Gary and Laney -- shrimping from a single boat. EC built its first boat in 1964 and opened its shipyard in 1974. Today, EC is a genuine anomaly: high-tech and Cajun. "Cajun shipyard" means a company owned by Cajuns and employing Cajuns (mostly welders) who pride themselves on tackling problems unconventionally. "Cajun engineering" means that technical problems are handled more on the basis of common sense and experience than formal training in naval architecture or engineering.

The one son -- Gary -- is responsible for the company's financial affairs. The other -- Laney -- is the principal entrepreneur at EC. More than anyone else this author has met over the years on such site visits, Laney Chouest comes closest to Schumpeter's characterization of the entrepreneur.

Together Gary and Laney are the efficient cause driving a company which with every ship built innovates a new set of custom-designed services for a customer. The company operates in this fashion not because of the demands of the market but because the two sons and the father relish the challenges of unusual projects which are especially demanding even for a Cajun shipyard.

The EC fleet contains 37 vessels all of which are crewed by EC personnel. Its customers have widely different needs and operate in climates and weather conditions as different as the Gulf of Mexico, North and South Atlantic Ocean, North Sea, Baltic Sea, Mediterranean Sea, and the Pacific Ocean. At the time of the site visit, the company was building a 300 ft icebreaker-research ship for the National Science Foundation. The EC design calls for a crew of 22 members and provides accommodations and working space for a maximum of 37 polar scientists. The scientific work is to be supervised by a chief scientist who is designated to handle problems relating to that work, such as daily schedules.

In the Gulf of Mexico, EC is capable of servicing every phase of offshore oil exploration and clean up. With the addition of fire-fighting equipment to certain vessels engaged in this work, EC is capable of fighting major fires in the Gulf and, in fact, has supplied important assistance of this type to an oil tanker on fire off the Texas coast.

The EC fleet includes four specially designed tractor tugs which service the Trident submarine base in King's Bay, Georgia. The design of these tugs is such that the paddle-type propeller is located roughly amidships, providing much greater stability in towing operations. The propulsion unit is designed and manufactured by the German firm Voith.

EC provides seismic vessels which operate in the summer in the North Sea and at other times of the year in the Mediterranean and off the coast of the Congo. Routine servicing of the vessels is performed at various shipyards in their area of service.

Two EC vessels are under charter to the U.S. Navy near Heard Island, 2,550 miles southwest of Perth, Australia and are engaged in global-warming research. EC is interested only in unique work of this type for the U.S. Navy and has passed up opportunities for what it calls "commodity work." In the San Diego area, EC operates under a charter to the U.S. Navy a special deep submersible support vessel. This project was the first real government proposal for EC. Today, EC is the largest supplier of special vessels for the U.S. Navy.

Following Walter Ong's description of the male who is required to differentiate himself from the female,¹ Laney is a risk taker, restless and dissatisfied, eager for the rough and tumble contests that help affirm his masculinity. Gary is the company's direct link to outside sources of credit without which innovations become much more difficult to implement. Together with a valued and valuable workforce, Gary and Laney Chouest are Edison Chouest Offshore.

Shipyard That Operates Like an Aerospace Firm: Textron Marine and Land Systems²

Textron Marine and Land Systems (TMLS) operates a multi-building production complex and administrative offices in New Orleans. TMLS is the second largest manufacturing firm in the New Orleans area.

The company produces advanced marine vehicles, two types of which are air cushion vehicles and surface effect ships. Innovation at TMLS can be characterized as both inward-looking toward the process of production and outward-looking toward the needs of the marine-craft market. The company's senior management asserted that at TMLS there has been no dramatic, one-time innovation. Instead, innovation has taken place gradually, in small steps, over a 25-year period.

¹ See Walter J. Ong, S.J., *Fighting for Life: Contest, Sexuality, and Consciousness*, Ithaca: Cornell University Press, 1981, p.43ff.

² From three site visits to the company's facilities in New Orleans, Louisiana, two in 1992 and one in 1994.

TMLS is one of 33 divisions of Textron which is a diversified manufacturing and financial-services company organized into three operating groups: Aerospace Technology, Commercial Products, and Financial Services. Even though TMLS is officially classified in shipbuilding and repair, it is located in the parent organization's Aerospace Technology group. More than 90 percent of TMLS sales in the early 1990s were to the federal government.

Innovation at TMLS is driven importantly from the way in which the production process is organized and administered. TMLS builds marine craft but operates like an aerospace company. TMLS's major marine-craft program is its landing craft, air cushion (LCAC) which was designed to carry a 75-ton main battle tank at speeds greater than 40 knots. TMLS did not innovate the basic air cushion technology. Rather, it borrowed the technology from a British firm which had applied it in commercial craft operating in the English Channel. From the very beginning, according to TMLS officials, this technology has been linked to aircraft technology.

With the exception of the fans or propellers which drive it, the LCAC is all welded aluminum construction and features three major components: (1) modular lift system, (2) modular propulsion system, and (3) hull. All of the components, with the exception of the housing for the propellers, are built at its New Orleans facility. TMLS has made innovative improvements in two general areas of LCAC manufacture: (1) propulsion efficiency and (2) welded-plate structure and rubber-skirt technology. Production of the LCAC began in 1982. The manufacturing cycle for the craft is one year.

The TMLS work force is made up of persons who, prior to their employment at TMLS, were untrained and inexperienced. TMLS offers pre-employment training over a four-week period in eight two-hour sessions. The instructors are TMLS shop-floor supervisors. None of the trainees are paid nor are they guaranteed a job. TMLS promises only that they will be given first priority in the company's next round of hiring from the entire applicant pool. Top pay for production workers can be achieved after 4 to 4.5 years on the job in a specific grade. TMLS makes no individual awards to production workers for job performance.

The LCAC is produced in an L-shaped building in which the craft moves along one side of the building where the hull is fabricated upside down and, upon completion, is turned over at the corner of the L. On the other side of the building, the aluminum sheets are cut for the hull and the various modules by a robotically-operated machine and the modules are lifted into place and welded to the hull after it has been turned right side up.

Unlike some shipyards, at TMLS all manufacturing is performed under roof. This allows the company to improve the quality of its welds and to offer a full 8-hours work without weather interruptions. Production is handled by seven basic teams called Manufacturing Improvement

Teams. TMLS reduced labor hours by 12 percent from the first LCAC to the third unit and by 58 percent from the third to the 44th unit. Only 0.3 percent of total touch labor hours is for rework. In 1989 TMLS was able to meet its contractual obligation to deliver a craft which in constant dollars was \$300,000 less expensive than one produced in 1980.

Productivity at TMLS centers around safety, housekeeping, recruiting, and training, and includes self inspection, accountability, and audit. Without this productivity program, the TMLS president asserted, the LCAC simply would not exist. Indeed, TMLS's contract with the Defense Department was terminated in 1976 because Department officials were convinced that TMLS could not build a craft which would meet its design specifications to bring ashore the Marine Corp's main battle tank.

TMLS also manufactures a smaller air-cushion vehicle for the civilian market. The C-7 fast ferry has an aluminum platform and a glass-reinforced plastic (GRP) superstructure. The craft is 60 feet in length, is capable of carrying a 7,000 lb. payload, and accommodates 35 passengers in airliner-type seating. A fire/rescue variant of the C-7 has been delivered recently to Singapore for use at the city's airport. This craft is the first in the world of its size. GRP fabrication has the following advantages: weight reduction, corrosion protection, shock resistance, cost savings, and aesthetics.

With regard to air cushion technology, TMLS is innovative twice over because in the case of the LCAC it introduced the technology to the military market and in the case of the C-7 fast ferry and its fire/rescue variant TMLS re-introduced the technology to the non-military market.

TMLS also manufactures a particularly innovative monohull for the U.S. Coast Guard which rescues on average 20 persons per day and requires a rescue craft which can operate in especially heavy seas. Of special interest is TMLS's 47' motor lifeboat, six of which have been built. The 47' heavy weather craft incorporates TMLS's own passive, self-righting capability which allows the craft to rollover over completely, to pitch-poll or lunge bow first, flipping end over end into swells, and self-right in less than 30 seconds. Significantly, the TMLS motor lifeboat is able to survive in such heavy seas and still *continue operating on its mission* [emphasis of the TMLS president]. The motor lifeboat is designed to operate in seas as high as 25 feet and against headwinds up to 80 miles per hour.

To manufacture the motor lifeboat TMLS had to innovate solutions to a number of critical design and manufacture problems. Since the craft's self-righting capability is based on its buoyancy, the designers worked at weight tolerances of ounces. Certain compartments had to be air tight. Because the craft likely would become airborne in heavy seas, the welds in the hull have to withstand unusual stress loads. The craft's engines have to continue operating in the upside-down

position for the craft to continue operating after a complete rollover or pitch-poll.

Innovation at TMLS encompasses both the workplace and the marketplace and blends both activating principles of competition and cooperation along with their corresponding masculine and feminine gender traits. This blending at TMLS appears to utilize these two organizing principles and gender traits in approximately equal proportions.

To the extent that job readiness, work effort, and on-the-job performance are promoted in the TMLS workplace, the company effectively affirms the principle of equivalence. The company's hiring and utilization of women in various better-paying shop-floor positions suggest an awareness of its workplace obligations under distributive justice. Its handling of LCAC production by means of seven Manufacturing Improvement Teams indicates an awareness of the importance of contributive justice.

CRUDE OIL ENTREPRENEURS

Two companies are classified as crude oil entrepreneurs. John E. Chances and Associates of Lafayette developed STARFIX which is a satellite-based technology to position drilling rigs as precisely as possible in the Gulf of Mexico. The closer a rig is positioned to the place where oil is expected to be found, the more likely the drilling company will actually strike oil. LOOP (Louisiana Offshore Oil Port) is a specialized, one-of-a-kind port facility headquartered in New Orleans and operating in the Gulf of Mexico to offload, store, and delivery crude oil supplies. LOOP is organizationally innovative in that it is owned and directed by five oil companies that, while they compete in the product marketplace, actually cooperate in the market for crude oil. Both LOOP and John E. Chance and Associates won the U.S. Senate Innovation Award.

STARFIX Positioning Technology: John E. Chance and Associates¹

The John Chance family risked the future of a company which had been operating successfully for nearly 30 years in order to develop a more accurate positioning technology which would allow it to cut the cost of its services to its clients and without which it would not have been able to survive the crisis in oil prices during the mid 1980s.

John E. Chance and Associates (JECA) began in 1957 as a family-owned and operated, oil-related, land-survey business and later branched into survey work offshore, helping to position drilling rigs at a precise location pre-determined by geoscientists to increase the probability of striking oil. Over the years, JECA grew and developed until in 1983 it dominated the

¹ From a site visit to the company headquarters in Lafayette, Louisiana in 1989.

positioning-system market in North America. By 1984, however, after the price of crude oil had dropped sharply it became clear at JECA that there was a need to develop a more accurate positioning technology which would reduce the cost to put a rig in a pre-determined location in the Gulf of Mexico.

At that time, the founder decided to gamble on STARFIX, a satellite-based positioning and navigation technology. All of the funds required to develop STARFIX were internally generated. Much of the success of the STARFIX project is attributable to Dr. Lee Ott and Thomas Chance, one of the sons of the founder with a strong background in electrical engineering. An outside scientist, Arthur Dennis, played a key role in the invention of STARFIX.

With STARFIX, JECA is able to position a customer within five meters of a given off-shore position with 95 percent confidence. At the time it was first marketed in 1986, STARFIX was the only commercially available satellite-based system of its kind in the world capable of deep-seismic navigation (depths greater than 8,000 feet).

STARFIX made JECA a world-leader in the market by giving it a great technological advantage over its competitors. Its coverage, however, is limited to 500 miles off the coast of the United States because it utilizes four satellites in stationary geosynchronous orbit around the equator. Thus, JECA's main market is technologically constrained to the Gulf of Mexico.

Strictly speaking, STARFIX is a black box. The hand-lugged instrument is manufactured and serviced by JECA and leased to its customers. With STARFIX the company has been able to reduce the cost of its services by 15-60 percent. Company officials claim that productivity on ships of the U.S. Geological Survey and National Oceanic and Atmospheric Administration has improved by 100 percent with STARFIX.

Additionally, JECA operates a sophisticated computing center which gathers and stores detailed information about the floor of the Gulf and above- and below-water structures and obstacles. The system allows the company to display the complete data set for any area in the Gulf in graphics form on a computer terminal. JECA has been collecting and compiling this information since its establishment as a necessary part of its services in safely positioning its customers and in assuring them which they can drill without fear of an unseen and unexpected obstacle such as a sunken ship or pipeline.

JECA is an example of masculine-type entrepreneurship focused mainly on the marketplace and driven by competitive forces. Since winning the Innovation Award in 1989, John E. Chance and Associates has been sold to the Fugro Group of Companies.

Alliance for Offloading, Storing, and Delivering Crude Oil: LOOP¹

Louisiana Offshore Oil Port (LOOP) was conceived in the early 1970s as the first deepwater oil port in the U.S. Construction of the LOOP complex of facilities began in late 1978 and operations got underway in May 1981. LOOP remains today a privately-held corporation. Its facilities, all of which are located in Louisiana, include a marine terminal which is approximately 18 miles off the Louisiana coastline, a small boat harbor, a storage terminal and operations center, and a separate office headquarters. LOOP is an awesome technological innovation to the process of production and an extraordinary organizational innovation to the management of the enterprise.

LOOP is the only deepwater oil port in the entire United States. It has a maximum offloading capability of 100,000 barrels per hour. The facilities were built at a cost of \$850 million and the funds were raised through tax-exempt revenue bonds. The sheer physical size of LOOP's operations strongly suggests that none of the five investor companies (Marathon, Texaco, Shell, Ashland, and Murphy), especially the smaller ones, could afford to build, maintain, and efficiently operate the physical assets without the others.

The value of annual throughput is in excess of \$5 billion of which about 15-20 percent is from shippers offloading cargo for some company other than the five investors. LOOP is able to store up to five million barrels in each of eight salt domes in its storage terminal. It is only within the past several years, however, that LOOP has been able to turn a profit.

The control room crew members at the marine terminal operate like air traffic controllers. There is a two-mile wide corridor extending further out into the Gulf of Mexico where all marine vessels are tracked by radar and tankers calling on the marine terminal are directed by the control room. Only one tanker at a time can be offloaded at one of the three SPMs in water depth of 115 feet (today's supertankers require water depths of up to 85 feet to operate safely). Other tankers which cannot be accommodated at one of the SPMs when they arrive on station are required to wait in a designated area reserved specifically for that purpose.

The oil is pumped from the tanker tied at the SPM to the marine terminal in a 56-inch diameter submarine pipe. From the pumping platform, the crude oil is pumped to shore through a 48-inch diameter submarine pipeline. The pumping platform houses a small laboratory for analyzing samples of the cargo being offloaded in order to determine its specific contents because LOOP is accountable for whatever it gets unless it can establish that the cargo includes foreign substances such as water.

¹ From a site visit to the company's facilities including its office headquarters in New Orleans, Louisiana in 1992.

LOOP's small boat harbor and booster station store large spare parts for the pipeline as well as a variety and large amount of environmental-protection equipment, hoses, and hawsers. LOOP is the only port which has a leased aircraft dedicated solely to dispersing chemicals in the event of a spill at the offshore marine terminal.

At the storage terminal and operations center, crude oil is pumped from the marine terminal into the top of a salt cavern where it is stored until it is ready to be shipped to a refinery. The cavern is completely filled with brine until the oil is pumped into the cavern. This pumping action forces the brine out the brine line at the bottom of the cavern to the brine storage reservoir. The process is reversed when the crude oil is pumped out of the cavern into a connecting pipeline. Each of the five investor companies has its own designated pipeline. No mixing of brine and crude oil occurs because brine has a heavier specific gravity than oil.

LOOP enhances productivity and quality for its five investor companies through the safe offloading, storing, and pipeline delivery of crude oil to their refineries thereby avoiding the considerable costs and liability associated with collisions, spills, explosions, and fires which are a greater danger in a crowded port near a major population center such as New Orleans or Baton Rouge. Additionally, by carefully analyzing the oil as it is being offloaded at the marine terminal, LOOP is able to determine whether it meets or falls below the refiner's contamination standards thereby helping that company manufacture refined products of higher quality at lower cost.

At the marine terminal in the Gulf of Mexico, tankers tie to one of three Single Point Moorings (SPMs) which are located some 8,000 feet from the terminal and which are designed to handle ships weighing up to 700,000 deadweight tons. The *Jahre Viking* -- the world's largest vessel at 555,819 deadweight tons -- has used the LOOP marine terminal.

Given the huge size of the vessels handled at the LOOP marine terminal, the company helped develop and leases an emergency response vessel to furnish escort and emergency towing assistance to tankers calling at the marine terminal in the event of a steering or engine failure. The LOOP Responder is the largest, most powerful, tractor tug in the world and has the following additional capabilities: firefighting, oil skimming and recovered oil storage, containment boom storage and deployment, and dispersant spraying. The November 1992 *Maritime Reporter* listed the LOOP Responder¹ as one of the thirteen outstanding workboats built in a U.S. shipyard in 1992.

¹ Built by Edison Chouest Offshore.

The various terminal, harbor, and storage facilities built and operated by LOOP represent a massive technological and engineering achievement in the oil industry. LOOP is innovative in another way, relating specifically to how the company is managed and controlled. At the very beginning, there were nineteen companies with an interest in developing LOOP. At the present time, there are five investor companies. The largest investor holds a stake that is about ten times greater than the smallest. Even so, each investor company has only one representative on the board of directors and each representative holds only one vote. The president of LOOP reports directly to the board of directors. LOOP is an excellent example of an industry-specific, supra-firm alliance.

All five of LOOP's investor companies cooperate in the offloading, storing, and delivery of crude oil at the very same time they continue to compete in the market for refined products. Thus, the five investor companies affirm the social value of individual freedom which underpins the organizing principle of competition and the social value of community or teamwork which supports the organizing principle of cooperation. In other words, LOOP is a blending of both gender traits. In the resource market the five investors collectively built and operate LOOP in the spirit of a real championship team, yet in the product market each one individually competes to be the most valuable player.

LIGHT MANUFACTURING ENTREPRENEURS

There are four companies which are considered in the light-manufacturing category. The first is AT&T which operates a manufacturing facility in Shreveport and which developed and successfully implemented The Shreveport Advantage, a program to improve quality and productivity in the manufacture of commercial telephone instruments. Stuller Settings is the largest manufacturer in the United States of gold settings for jewelry. The company, which operates from Lafayette, deals directly with thousands of small retail jewelers across the United States. In the mid to late 1980s Stuller Settings innovated a number of steps to enhance quality and productivity. Amerchol is a small (less than 50 employees) manufacturer of ingredients used in the production of hair-care products such as shampoo. The company innovated certain improvements in quality and productivity through its Total Quality Process program. Wemco is the largest producer of men's neckwear in the United States. The company is noteworthy for developing and installing a computerized system which encompasses every phase of operations from purchasing the material to delivering the final product to retailers. AT&T, Stuller Settings, and Amerchol were selected for the U.S. Senate Productivity Award. Wemco received the U.S. Senate Innovation Award.

*Shreveport Advantage: AT&T*¹

AT&T operates a large facility in Shreveport, Louisiana for manufacturing commercial telephone instruments. The very survival of the plant was threatened by the competitive forces unleashed by divestiture in January 1984. One year later, some 3,000 Shreveport workers were laid off as residential phone production was transferred to AT&T in Singapore. Even so, the Shreveport Works still could not compete effectively in the international market for business telephones. Additionally, AT&T overestimated the business market. In mid-1986, the company installed a productivity- and quality-improvement program which it called the "Shreveport Advantage." This program was a complete "makeover" of AT&T's Shreveport Works and borrowed heavily from Japanese manufacturing experience. The Shreveport Advantage represented AT&T's effort to make its Shreveport Works the best electronic manufacturing facility in the world.

The Shreveport Advantage attacks non value-added costs by concentrating on three key elements in the production process: layout, materials, and workers. The program totally rearranged the plant layout (excluding molding operations) from functional shops to focused factories. Each one of the four focused factories manufactures one or more specific products from machine cell to packing. AT&T defines a focused factory as a manufacturing layout dedicated to products with similar work content which maximizes overall quality, throughput, and productivity. The plant has eleven other functional factories which support the four focused factories. The focused factory incorporates such manufacturing technology improvements as in-line inspection, "pull" manufacturing, line-stop, quality control at the source, and employee training. The four focused factories are highly vertically integrated processes based on just-in-time manufacturing principles in which the product moves from circuit board to packing box in less than 2.5 hours.

Materials costs represent about 70 percent of the total cost of production at AT&T Shreveport Works. On the other hand, manufacturing labor costs represent 10 percent of total costs and only two percent of sales price. Accordingly, The Shreveport Advantage aims at making the Shreveport Works more competitive by reducing defects in materials as shipped by their vendors well below 3,000 parts per million, by cutting waste in materials utilization on the factory floor, and by reducing work in process so that all work moves through the focused factory without stoppage.

Vendor partnership sets up a formal, long-term relationship with vendors which improves quality, service, and cost by means of "mutual trust, cooperation, and coordination." A vendor partnership steering committee was established intermediary between the various AT&T

¹ From a site visit to the company's complex in Shreveport, Louisiana in 1988.

commodity teams and the senior management. Five specific goals were established: (1) reduce supplier base; (2) improve supplier quality; (3) cut procurement lead-time; (4) enhance delivery reliability; and (5) curtail total cost.

Typically, a large manufacturer such as AT&T in Shreveport deals with thousands of vendors, some near at hand, others at considerable distance. Vendor partnership works by detailing a representative from the customer-firm (i.e., AT&T) to the vendor-firm to assist the vendor especially in the areas of quality and deliverability which directly affect the customer-firm's cost of production. The detailing step makes it difficult and expensive to cover a large vendor base, especially at a considerable distance from the customer's plant.

The vendor in such an agreement (which is formalized in writing) receives certain assurances that the relationship with the customer-firm will be more secure as long as the vendor partner meets its obligations under the agreement. Vendor partnership is an example of inter-firm cooperation which focuses attention on the workplace in order to resolve problems which show up in the marketplace.

A handbook has been developed and is used to help vendors achieve the reductions in defects needed to reduce repair costs in the manufacturing process. This part of the Shreveport Advantage emphasizes quality, delivery reliability, procurement lead-time, and cost. In 1987, three vendor partnerships were negotiated; 20 more were targeted for 1988.

The materials management aspect of the Shreveport Advantage calls for a 90 percent reduction in materials so that there are only five days of materials on the factory floor (more is available in the warehouse). The Shreveport Works has modified a MRP materials planning system to incorporate just-in-time manufacturing principles. The software package is called ASSIST (Advantage Shop Scheduling Integration Status). Additionally, good housekeeping is heavily emphasized. Each team has assigned specific housekeeping duties; the plant has no crews dedicated exclusively to janitorial work. No smoking or eating are allowed except in break areas where TV monitors provide a stream of information about the plant and its employees.

The worker aspect of the Shreveport Advantage emphasizes quality and continuous improvement in terms of waste, defects, failures, and the like. Employees are encouraged to acquire a value-added mindset. Toward that end, 19 Quality and Process Improvement teams have been established throughout the plant. Each team is made up of a supervisor, engineer, and a few operators who periodically rotate off and are replaced by other operators from the same operating unit. Similarly, Administrative Process Improvement teams have been established for white-collar workers.

A two-day shared-time training program has been developed and implemented to train the work force in Shreveport Advantage including just-in-time principles, quality, and ASSIST. More than 30,000 hours of training have been provided; an estimated 80,000 are required to fully support current projects. Shared-time training means that the company pays for one-half of the two days of training required and the employee pays for the other through use of leave time.

The Shreveport Advantage is driven by quality and efficiency (e.g., unit cost) wherein productivity improvement follows as a natural and logical consequence. AT&T senior management asserted that output per labor hour had been raised by more than 50 percent in the 14-15 months that the Shreveport Advantage had been in place. Another key element in AT&T's productivity under the Shreveport Advantage is the refinement of the manufacturing processes and the requirement that engineering make the design for the process. Senior management also said that with in-line inspection of production was running 98-100 percent defect-free.

The Shreveport Advantage is a program which is focused primarily on the workplace and is driven powerfully by developments in a marketplace that due to divestiture has become much more competitive. More than anything else, the Shreveport Advantage innovated a new process of production relying principally on the activating principle of cooperation and its associated feminine gender trait. In this regard, the workforce and senior management had to rebuild a sense of teamwork to deal with the insecurities which followed the loss of employment in Shreveport connected with the transfer of residential telephone production to Singapore. The strong emphasis making every employee more accountable for improving quality in effect re-affirms the principle of equivalence.

The Wal-Mart of the Business: Stuller Settings¹

Stuller Settings (SS) in Lafayette, Louisiana is a manufacturer and distributor of jewelry componentry -- findings, settings, and mountings² -- for approximately 22,000 accounts mainly in the United States. While gold was the only metal used in manufacturing these items at the time of the site visit, gold platinum was under development. SS says that it has 40 percent of the retail market. Innovation at SS is strikingly similar to innovation at Terrebonne General Medical Center in Thibodaux. SS is a successful jewelry manufacturer which is flourishing in Lafayette, Louisiana when normally such U.S. companies operate only in New York City.

¹ From a site visit to the company's facility in Lafayette, Louisiana in 1989. Stuller Settings was described as "the Wal-Mart of the business" by a jewelry-store operator in Monroe, Louisiana who has monthly dealings with the company.

² Findings include rings, clasps, and beads. Settings are pieces which hold a stone. Mounting are pieces which do not hold a stone.

Matthew Stuller started in 1969 as a jeweler's assistant in Lafayette. Shortly thereafter, he opened his own business operating first from his car and then from space in his father's office building. Stuller's goal from the beginning was to operate as a wholesaler, shipping on the same day the order is received.

SS began casting jewelry in 1972-73 with an operating philosophy of providing service to small customers. SS currently manufactures 13,000 different items and uses a 3,000 square-foot area for inventory purposes. In 1988, SS had 9 inventory turns; one year later it had 7.2 turns. It takes 5-17 days to replace items which are sold. The average order is \$140; average sales per year per customer are \$1600. Both are consistent with the company's initial operating philosophy.

SS buys its gold through New York banks on the advice of certain financial specialists. For that reason, security at SS is quite tight: employees are not allowed to leave the facility during their shift and are permitted to take personal phone calls only outside their work area. Wearing personal jewelry on the job is not allowed except for wedding bands/rings.

SS is functionally organized as follows: sales, modeling, tool and die, research and development, wax impressions, metal fabrication, casting, assembly, finishing, quality assurance, inventory, and shipping. The facility is designed in such a way that there is a one-tenth mile track or hallway which connects the various departments and that some employees use on their break for exercise purposes.

Manufacturing at SS is based on the lost wax casting technique rather than the die method. At SS a method of casting using plastic molds has been perfected and produces many of the items which the company sells. SS takes pride in the quality of the items which it produces and in its customer service. An order placed by 2:30 PM will be sent to the customer by overnight express. A monthly newsletter is sent to SS customers which contains a new product listing. A complete catalog is published every year. New designs are sketched in pencil and paper fashion by jewelry designers who work under contract to SS and travel to Lafayette for that purpose. Order taking has been computerized for some time.

SS has innovated four programs to enhance customer service and quality: productivity enhancement, quality assurance, "Ideas Pay," and training. At the very beginning SS had to learn how to manufacture jewelry by the casting method. Over the years, management positions were filled by persons with craft experience. The result was that management was deficient of certain administrative skills and the plant was operating substantially below maximum efficiency. In 1985 SS experienced a substantial increase in growth but did not have a firm grip on its cost of production. Three years later, the company took note of a study done for the industry trade

association. The report indicated that jewelry manufacturers typically were operating about 50 percent below maximum efficiency.

SS hired the firm which produced that report to advise it as to how it could improve quality and productivity. As a consequence, three changes were suggested: (1) modify plant layout, (2) isolate individual work stations, and (3) specialize each worker in one skill only. SS implemented the first two recommendations but not the third. In the finishing department, for example, each worker routinely performs two tasks. Redefining work in that department in conformance with the third recommendation would increase the repetitiveness of the work performed there which in turn would raise the risk of tendonitis.

SS discovered that the isolated standard-rate worker does not enhance productivity and improve quality. Quite the contrary. An early attempt to use training to deal with this problem did not work. Vestibule training is currently in use and SS claims some early success. At the time of the site visit, 80 percent of the employees had completed the first phase of a three-phase training program.

The goal at SS is to increase productivity by having the employees working 90 percent of their time work "on standard" or on their primary job. A job performance card was developed for that purpose and detailed computerized reports by employee and department are routinely generated from the information taken from the card. Between April and November 1989, there was no improvement in the percent on standard time and there were large differences between the day shift and the night shift. Even so, SS claims to have raised its actual efficiency from 48 percent prior to implementing the consultants' recommendations to 58 percent at the time of the site visit.

SS has implemented time and motion studies through the plant and some of that work was being conducted at the time of the site visit. These studies will allow SS to establish a standard time for every task in the facility. SS does not provide incentive pay.

Approximately six of every 100 applicants are selected for employment at SS. Starting pay is close to the minimum wage with a \$.50 increase after 90 days. The top pay at SS is roughly 2.5 - 3 times higher than starting pay. New employees are trained in three phases. A re-training phase was to be added later. SS at the time of the site visit had completed some of the training manuals needed and eventually will have training manuals for every subsection in the plant. SS provides the routine employee benefit package including health and life insurance, profit sharing, credit union, buying privileges, holiday/sick/vacation pay, maternity leave, continuing education, access to family counseling, and assistance with substance abuse.

Quality assurance was first established at SS in 1984 and is driven by the slogans “do one, check one” and “do it right, do it better.”

The employee suggestion program “Ideas Pay” was first established in 1987 and failed at first because there was no feedback from the employees. Subsequently, “Ideas Pay” was modified to (1) involve the workers, (2) encourage bottom-up management, and (3) develop a listening attitude. In brief, suggestions are submitted in writing to a committee. Awards for accepted suggestions are based on estimated annual savings and must be approved by the president. There was a very large increase in the number of suggestions submitted in 1989 as compared to earlier years. At the time of the site visit, this program had paid out approximately \$2,800. There is no dollar limit on the maximum award. Monthly meetings are held in the lunch-room area to recognize and present awards for “Ideas Pay.” In addition to individual awards, SS puts on a “Grand Donut Party” for the department with the highest percentage of employees making suggestions.

SS is a major U.S. manufacturer of high-quality gold jewelry which has learned and emphasized quality both with its employees and its customers long before it began to focus on productivity. Between 1987 and 1989, however, SS came to realize the importance of productivity and has made important strides to actually measure and improve it. In fairness, it should be pointed out that the manufacturing process necessarily is very labor intensive, involving much tedious, hand work, and for those reasons major breakthroughs in productivity likely will not come from improved capital inputs.

Innovation at SS is both marketplace- and workplace-oriented. Its first concern is supplying its customers, many of whom are quite small retail jewelers, with quality jewelry componentry on short notice, often overnight. More recently, SS has become more aware of and more successful in putting together a more efficient workplace organization. In this regard, it has not been disabled by first efforts which did not succeed. Persistence -- the personality trait necessary to overcome early failure and rejection -- is clearly evident at SS. Long ago, Schumpeter identified this trait as most characteristic of the authentic entrepreneur.¹

As mentioned at previously, SS itself is a huge innovation, blending the organizing principles of cooperation and competition and their underlying social values of teamwork and individual freedom. Under normal circumstances, SS never would have been established anywhere other than New York City. The fact that it has thrived in Lafayette is attributable to the great entrepreneurial vision and energy of its founder.

¹ See Joseph A. Schumpeter, *Capitalism, Socialism, and Democracy*, New York: Harper and Brothers Publishers, third edition, 1950, p. 132.

*Total Quality Process: Amerchol*¹

Amerchol (AM) in Greensburg, Louisiana is a manufacturer of water-soluble polymers which are ingredients in personal care products such as shampoos and lotions. Amerchol, which operates three plants in the United States and in Europe, became a subsidiary of Union Carbide in 1985. AM's products are sold throughout the world and the company has both domestic and foreign competition. In the late 1980s, AM innovated a cultural change by introducing "Total Quality Process" into the workplace in part to improve product quality and profitability.

AM's Greensburg facility is located in St. Helena Parish which is an unusual site for a chemical plant. St. Helena Parish has a population of only 10,000 and one-half of the families in the Parish have incomes below \$10,000. Taxes paid by AM contribute 10 percent of the Parish's revenues. AM operates on a 50-acre site and at the time of the site-visit occupied seven acres. Within those seven acres is located the plant's waste-water treatment which is of great significance since the plant's treated waste water flows into the Tickfaw River which has been designated a scenic river. The plant employs fewer than 50 persons, all of whom are salaried. The production crews work 12-hour shifts, two days on and two days off, with every other weekend off. These crews change shift every week. There are ten paid holidays.

AM's polymer JR is manufactured from the cellulose in wood chips and for that reason is regarded as a natural product. Polymer JR has been successfully introduced into various markets where increasingly the customers of the final product are demanding natural products. The final product is shipped to personal care companies such as Revlon, Wella-Balsam, and Loreal, as an ingredient in their products.

As demand for the product grew overseas, competition increased. The management team knew that some changes would have to be made if AM were to remain viable. Costs would have to be reduced and production rates increased. A decision was made at AM to create a change in the workplace culture by introducing Total Quality Process (a new process, not a program) which rests most fundamentally on trust and a conviction that management is really willing to try. Implementation would be done by informal rather than formal methods.

Total Quality Process calls for improvement in four broad areas: quality, production, personnel safety, and environmental compliance by "doing the job right the first time" and on being "second to none." Performance is reviewed every month by the management team. AM's Total Quality Process seeks to achieve more participative management, to drive decisions to the lowest

¹ From a site visit to the company's plant in Greensburg, Louisiana in 1991.

level in the organization,¹ and to establish clear objectives and performance evaluation. From time to time, off-site brainstorming sessions are used for these purposes. Rewards are provided whenever monthly activities exceed the “best-ever” month in all four areas. Two typical awards were \$100 in every pay envelope and a dinner for all employees paid by the company. In 1990, four months were “best-ever.”

Quality of polymer JR is defined and measured in terms of color, viscosity, and appearance (i.e., the presence of brown or black specks in the powder). In 1987 customer complaints were running about 12 per year; in 1990 AM had three customer complaints. As to appearance, between 1987 and 1990 AM increased the percentage of pounds of product shipped passing the high-grade for appearance by 19 percent. At the time of the site visit, 90 percent of the pounds shipped by AM meet the high-grade standard and 98 percent of production is within all specifications.

Prior to Total Quality Process, quality was controlled by supervisors. In 1988, the operators were provided with one-half day training in statistical process control and statistical quality control. At that time, a statistical quality-control committee was established and responsibility for plotting the data was given to the persons who do the production work. Leadership in this area came from management not from specialists brought in as consultants.

The plant manager stated that productivity, defined and measured as cost per pound, had improved by nine percent over the period 1987-1990. Critically important to this increase was a 200 percent rise in pounds per labor hour. Improvements to productivity from better maintenance were achieved in two main areas: on-stream time and scheduled shutdown. As to on-stream time, the plant's performance has improved from 80 percent to 90 percent. Future improvements were expected from greater emphasis on preventive and predictive maintenance. Between 1987 and 1989, maintenance efficiency increased by 30 percent over the 1987-1990 period. At the same time, switching from fuel oil to natural gas resulted in a 40 percent improvement in utility cost.

Safety at AM is a high-profile activity which is driven by “always do better than best ever.” In 1990 there was one reportable injury -- a cut to the hand of a lab technician. At the time of the site visit, AM had achieved 291,893 hours since the last lost-time injury and 777 days since the last off-the-job injury. Significantly, AM had recorded 648 spill-free days and 248 days without a permit excursion. The safety-health-environment aspects of Total Quality Process highlighted three areas: improving attitudes, upgrading the plant, and a no-spill culture.

¹ This objective reflects an implied acceptance of the principle of subsidiarity even though no explicit reference was made to this principle during the site visit.

Turnover is quite low -- about 3 percent -- even though AM employees can earn more money in Baton Rouge. In 1990 AM entered Union Carbide's profit-sharing plan which extends to all AM employees. The plan at present pays one-half month's pay. The maximum payout is 15 percent.

The future for Total Quality Process at AM is built around "excellence through quality." According to the plant manager, there are seven keys to the future: leadership, organization, measurement, recognition, education, total involvement, and continuous improvement.

Total Quality Process at AM is noteworthy mainly it aims at changing the entire workplace culture. It is energized by the principle of competition and its underlying social value of individual freedom. In the four centrally-important areas of quality, production, personnel safety, and environmental compliance, Total Quality Process activates the work force to improve its performance every month by the workplace competitiveness implicit in "always do better than best ever" and the recognition which is given for best-ever performance.

As mentioned previously, at AM Total Quality Process innovation rests most fundamentally on trust. It is not competition and individual freedom which build and maintain trust but cooperation and teamwork. Thus, at AM both activating principles and their supportive social values have been employed to re-construct the company's workplace culture.

The emphasis on quality and productivity, on "doing the job right the first time" and avoiding off-specification production, reflects a concern for the principle of equivalence. The safety-health-environment dimensions of Total Quality Process are meant to reverse the parent company's provide the foundation for the process.

Bringing Men's Neckwear Manufacturing up to Computer Speed: Wemco¹

Wemco (WM) has innovated a completely computerized production process from raw materials to finished goods to assure that its customers receive the neckties they ordered in the right quantities, without defect, in a timely manner, allowing those customers to sell ties which are fashionable one season but not necessarily the next. In 1993 WM manufactured 9 million ties, making it the largest producer of men's neckwear in the United States.

The company was founded in New Orleans in 1925 by Samuel Pulitzer. Over the years, it has operated at three locations in New Orleans. WM has been operating at its present site since 1973. Today, the company is a privately-held family corporation under the direct management of the

¹ From a site visit to the company's manufacturing facility in New Orleans, Louisiana in 1994. It has since been sold by the founding family.

founder's two sons. One is chairman and chief executive officer. The other is president and chief operating officer.

The company manufactures ties under a variety of labels including Wembley, Oscar de la Renta, Tabasco, Endangered Species, and Je Suis, and under private labels for a variety of retailers including Belk Stores, Dillard's, J.C. Penney, and Wal-Mart. Included among the company's holdings is the Countess Mara factory in Highland NY. WM also operates a number of Factory Stores for closeouts and other men's accessory goods.

WM's business is very much like women's apparel: there are six seasons in the year. Some 70 percent of WM's sales are in the fashion end of the trade. The balance is in the basic end -- solids, stripes, paisleys -- which does not change much from year to year. A fashion tie has a short shelf life. Fashion ties which are not sold in one season end up on the customer's clearance rack. For those reasons, six times a year customers want the right ties, in the right quantities, manufactured without defects, delivered on time, at reasonable prices, each of which is transformed from a promise to a commitment under the principle of equivalence once WM enters a formal sales agreement with a customer.

In one sense, WM operates much like a traditional apparel manufacturer: cut the material, sew together the pieces, press, and pack them. Many of WM's workers are immigrants from Southeast Asia and are not fluent in English. WM has devised work routines to circumvent some of the language barrier: color coding of work in process, stacking the work to be done in certain work stations in a different manner on pushcarts than work which is ready to be carted to the next work station.

In another sense, however, WM is not a traditional apparel manufacturer. The company's computerized system allows it to give its customers what WM calls Quick Response. *From the perspective of the retailer*, WM's innovation is twofold: (1) new products for every season of the year (2) delivered more reliably than the competition especially those operating overseas. Without the computerized system WM simply could not be a player in the men's fashion neckwear market and would not be a major employer in the New Orleans area.

WM's system, all of the software for which was written in-house, has three main advantages: (1) reduced work-in-process inventory; (2) improved inventory tracking and reordering by the retailer through electronic data interchange; and (3) enhanced capability in receiving and distribution facilities to ship neckwear more accurately and more quickly to the retail location "store ready." An additional advantage is that WM is able to predict more accurately design and fashion trends. The company has been very successful with its field and stream ties, its Tabasco ties, and its endangered species ties. WM employs a former illustrator to render ideas and hard-

copy suggestions into full-color designs which can be evaluated by the senior management for production later as ties. This employee uses a computer scanner, a PC with appropriate design software, and a color copier to provide as many copies of any given design as may be required.

The computerized system drives all aspects of WM's business, including the Countess Mara plant. Sales representatives on a daily basis place orders electronically from the field with their laptop computers and have their catalogue files updated at the same time. In the factory, the system was designed specifically around the various steps in the process of production.

WM uses the system to do real-time scheduling of orders and to optimize inventory in order to reduce manufacturing cycle time. WM determined that there are more savings gained through control over these items where the available information about the material in process is more accurate than through reduction of the cycle time of individual operations. Reducing time between operations proved to be the most cost effective. As a consequence WM is able to hold down the cost of production, compete in the market place, and pay competitive wages.

Most importantly, the WM computerized system was adapted to the needs of the workforce rather than forcing the workforce to adjust their routines to the requirements of the system. *From the perspective of the WM shop floor employee*, the company's senior management has innovated a new process of production which accommodates sophisticated computer and bar coding technology to the skills, talents, and language faculties of workers whose formal education typically ended before or at high school graduation.

With this system, WM has been able to meet the challenges of tie producers operating in low wage countries, to adapt to changes taking place in retail distribution, and to other changes occurring in the marketplace.

In sum, six times a year WM puts at risk its reputation and financial fortunes by innovating men's fashion neckwear. In that sense, innovation has been outward-looking and masculine in character. However, without the computerized system which the company installed in 1992, it could not continue to operate as the largest manufacturer in the United States and compete successfully with companies operating in low-wage countries. In that sense, innovation at WM has been inward-looking and feminine in character.

CONSTRUCTION AND LUMBER ENTREPRENEURS

Two companies are included in this section on workplace and marketplace innovations in construction and lumber manufacturing. Both were named for the U.S. Senate Productivity Award. Harmony Corporation installed a computer system to reduce the time to prepare a final

bid for a project, refine its estimate to approximate the actual cost of the project, purchase materials and hire workers with the appropriate skills, track progress and efficiency in the field, prepare progress reports for its client and corporate headquarters, and measure the efficiency of its foremen. Temple-Inland Forest Products implemented a five-part improvement program: (1) structured hiring process to improve stability; (2) team incentive plan to achieve goals which require a “stretch”; (3) quality improvement which organizes work around area, task, and lead teams; (4) operations improvement to enhance safety, quality, and productivity; and (5) continuous process improvement to eliminate waste.

TAKE/PBR System: Harmony Corporation ¹

Harmony Corporation (HC) is one of a group of companies under Turner Industries. HC is the largest operating company in the group specializing mainly in construction projects in the refining and petrochemical industries. HC is a nonunion shop. The company was established in 1975 at the urging of Exxon which offered to support the new company with construction contracts provided it was not unionized. HC traces its name to a desire to create more harmonious labor relations in the industry. The company engages in construction projects -- mainly concrete, structural steel, and mechanical -- and maintenance work. There is a 50/50 split between construction projects and maintenance work. Construction projects are done on a lump-sum bid basis. Maintenance work is done on a cost-reimbursement basis. About 60 percent of its overall business is in piping work.

The improvement which company officials wanted to describe and present to the site-visit team is in the area of management control systems, specifically in the area of planning, scheduling, and efficiency which today is much more important than years ago. In 1994 HC had a total of 80 clients. Its major competitors include Jacobs Engineering, Bechtel, Fluor-Davis, Brown and Root, H.B. Zachary, and Austin Corporation, along with various smaller companies operating in the place where the work is to be done.

HC at times works as a subcontractor for one of its competitors, that is at times HC is hired by one of its competitors to undertake either work for which HC has special qualifications or for which it has the workforce in the right place at the right time. This practice was a recent development in HC's business.

At HC the incident rate for OSHA recordable cases was approximately 3.008 as compared to the industry average of 14. At HC there is one recordable case for every 65,000 hours of work. Figures supplied by the company after the site visit indicate a 1992-1994 average rate of 4.83

¹ From a site visit to the company's headquarters in Baton Rouge, Louisiana, in 1995.

with one recordable case for every 41,479 hours worked.

A detailed description and simulation of HC's TAKE/PBR system followed. TAKE is in-house developed software that utilizes the current generation of powerful personal computers to estimate the labor and materials required for a given project based on information inputted into the program by an estimator from the detailed isometric drawings prepared for the client. The estimator inputs the information using a digitizer which HC developed expressly for this purpose. The digitizer simplifies this work because it is based on a system of abbreviations which have been used throughout the industry for years such as "BW" for butt weld.

This system, which HC developed on its own because nothing was available off the shelf, allows the company to reduce the amount of time to prepare a final bid for a project, and to refine its estimate so that it more closely approximates the actual cost of the project. It prepares detailed labor and material reports which inform the company well in advance of the project so that it can take the steps necessary to purchase the needed materials and to hire workers with the appropriate skills for the work at hand. HC claims that TAKE gives the company a significant edge over its competitors.

PBR is HC's computerized project management system for tracking progress and efficiency. PBR stands for project budget report and is the forerunner of TAKE. PBR also is PC based and designed specifically for use in the field by the field project manager using detailed information received from the various crew foremen on the job as to the specific work which has been completed.

PBR is linked to TAKE in that information from TAKE is downloaded to PBR. PBR generates information on percent of project completed which allows HC to prepare a more accurate progress report for its client and for corporate headquarters and to minimize the inputs used on the project. PBR also gives the company improved measurement of the efficiency of its foremen.

A demonstration of TAKE/PBR system was provided based on information for a fictitious project. A video followed which showed how the system operates in the field. The system has the following advantages for HC: reduces project cost, improves project management, allows HC to request payout from clients with greater confidence in the accuracy of its reporting to those clients, and permits HC more control of the interactions with its clients.

The TAKE/PBR system represents a definite improvement in productivity for the company. The savings associated with this system for the period 1990-1994 were estimated to be \$550,596 which is based on releasing invoices to HC clients one week earlier. This earlier release reduces the effective interest paid by HC on its monthly billings; an interest rate of 8 percent was used in

estimating the savings to HC. Additional savings likely were generated in labor costs. Based on HC sales figures of \$70 million and HC's own statement that there is a 50/50 split between construction projects and maintenance work, if labor costs make up 20 percent of total costs in construction projects, the cost of labor on an estimated \$35 million in construction projects is roughly \$7 million. If TAKE/PBR achieves a 10 percent improvement in labor costs, the savings amounts to approximately \$700,000 per year.

Innovation at HC is essentially informational in nature. TAKE/PBR improves the quality of the information available to HC management and to its clients. Thus at HC innovation is inward-looking toward the workplace, allowing it to better manage, deploy, and evaluate its work force and thereby re-affirming the principle of distributive justice. At the same time, it is outward-looking toward the marketplace, providing its clients with better information regarding the status of their projects, thereby reinforcing the principle of equivalence. Thus, HC blends the operating principles of cooperation and competition, along with their associated gender traits of femininity and masculinity.

Five Part Improvement Program: Temple-Inland Forest Products¹

Temple-Inland (TI) began in the late 1800s as The Southern Pine Lumber Company in Diboll, Texas where its headquarters are located still. It was incorporated in Delaware in 1983. TI is a holding company with major interests in paper, packaging, building products, and financial services. Temple-Inland Forest Products (TIFP) is one of TI's three major subsidiaries and is composed of two operating groups -- bleached paperboard and building products -- and six operational areas -- Fiberboard, particle board, gypsum wallboard, lumber, plywood, and retail distribution. Lumber operations are established at five locations in the United States., including DeQuincy and utilize raw timber cut from of TI's 1.9 million acre timberland holdings or purchased through the market.

Operations in DeQuincy got underway in May 1990 in a facility built by TI as a highly automated and computerized dimension lumber mill designed to product 100 million board feet annually. The facility operates with a non-union workforce of 173 hourly, salaried, and contract personnel. Twenty of the 173 employees are salaried.

TIFP sells mainly to customers in Texas, Louisiana, Oklahoma, Arkansas, and in the northwestern and midwestern United States. In general their customers are retailers specializing in cash and carry and contractor trade, large distributors, lumber treaters, and industrial customers.

¹ From a site visit to the company plant in DeQuincy, Louisiana in 1995.

TIFP has implemented a five-part improvement program grounded in the ideas of W. Edward Deming and William Conway. First, its structured hiring interview which involves three TIFP employees -- superintendent, supervisor, and hourly worker -- follows a routine of preset questions which every applicant must answer. To be hired, an applicant must be approved by all three members of the interview committee. The goal of this part of the improvement program is to produce a more a more stable, team oriented workforce. Turnover at TIFP has dropped from 50 percent to 20 percent.

Second, the company's team incentive plan is modeled after plans in place elsewhere in the company. The incentive plan is based on certain goals which are set by a plant-wide committee of hourly and salaried employees, over which the plant has some control, and are attainable but requires a "stretch" to achieve. The plan includes several actual performance indicators such as production, sawmill uptime, defects, wasted lumber. Each indicator is assigned a threshold value where 2 percent credit is achieved and an outstanding value where 5 percent credit is earned. The credit for each performance indicator is weighted and summed and this overall percentage is applied every quarter to each employee's regular and overtime pay to arrive at his/her bonus for the quarter. In 1994, a total of \$147,000 was paid in the form of bonuses under this plan.

Third, TIFP's quality improvement program is organized around three types of teams. In a structured five-step problem-solving process, the *area* team brainstorms where improvements are needed and identifies the one problem that will be addressed directly. The area team then selects a *task* team to join the area team in the problem-solving process. The recommendations are forwarded to the *lead* team for review and approval. The goal of this part of the company's improvement program is to assure continuity between the first and second shifts.

Fourth, TIFP's operations improvement program empowers individual employees to institute change in the work process in order to improve safety, quality, and productivity. The process requires the employee to complete a one-page form which is presented to a coordinator who, in turn, hands over the form to the employee's direct supervisor. The ideas then are presented for approval at the monthly meeting of the committee charged with responsibility for the operations improvement program and are judged on the basis of originality, feasibility, and practicability. In the most recent 18-month period about 800 suggestions for improvement had been submitted of which 65 percent were accepted.

Fifth, and last, Temple-Inland's continuous process improvement involves salaried employees and focuses on eliminating waste in the operation, through such new arrangements as vendor partnership agreements. This phase of the overall company improvement program had only just begun and for that reason company officials were not able to provide detailed information as to

its effectiveness.

TIFP facility in DeQuincy is a very well managed facility by a small team of senior managers who are competent, forthcoming, straightforward, and justifiably proud of the plant's achievements. In this regard, for example, production in 1994 was some 38 million board feet in excess of the plant's rated capacity. Further, the plant had "no findings" from the federal Environmental Protection Agency or the state Department of Environmental Quality.

TIFP's five-part improvement program clearly is focused on the workplace and is driven by a deep commitment to almost every phase of plant operations. The plan relies on improved cooperation among all employees and in that sense is associated with the feminine gender trait. As we observed earlier with regard to AT&T's Shreveport Advantage plan there is strong emphasis on making every employee more involved in and accountable for improvements as individuals and as a team and in turn better rewarded for their improvements. This emphasis effectively reinforces both the principle of equivalence and the principle of contributive justice. The algorithm used in the team incentive plan affirms the principle of distributive justice.

HEAVY MANUFACTURING ENTREPRENEURS

Four companies are reviewed in this section on workplace and marketplace innovations in heavy manufacturing. All four companies were named for the U.S. Senate Productivity Award. General Electric of Shreveport won the first U.S. Senate Productivity Award in 1984 for its gain-sharing program. Martin Marietta Manned Space Systems was honored in the following year for achieving productivity and quality improvement by means of its system refinement teams. Stone Container innovated a special program known as IQS (Innovation, Quality, Service) to raise quality and productivity at one of its two paper mills in Louisiana. Cameco Industries was selected for the Productivity Award for several improvements which were achieved when the company opened a second plant designed for assembly-line production to complement its original plant which was designed for stall-build manufacturing.

Sharing the Gains: General Electric¹

General Electric (GE) produces pole- and pad-mounted electrical distribution transformers at its facility in Shreveport, Louisiana. In the early 1980s, GE introduced a gain-sharing plan to help improve quality and to reduce the unit cost of production based directly on Mitchell Fein's Improshare. The GE management in Shreveport had to sell the gain-sharing program first to the highest corporate officials and then to the plant employees. At the time of the site visit in 1984,

¹ From a site visit to the company's facility in Shreveport, Louisiana in 1984.

the program was being administered without substantial cooperation and information exchange with GE facilities elsewhere. In simple terms, Improshare works by paying the employees more whenever they produce defect-free units using fewer hours of labor inputs than during the base period. The gains which are achieved are estimated by determining the number of hours it would have taken to produce the current week's output using the standard rate from the base period and comparing those hypothetical hours to the actual number of hours expended on the current week's production.

This gain, which is expressed as a moving nine-week average, is shared on a 50-50 basis with the employees. For example, if the average output for the past nine weeks is produced with 36 percent fewer hours than it would have taken using the standard rate, one-half of that gain, or 18 percent, is added to the pay of the workers for the current week. Thus, if a worker's base pay is \$400 for the week, he/she receives gain-sharing pay of $(.18)(\$400) = \72.00 . To link gain sharing more closely to productivity and quality improvement, gain sharing is paid weekly on a different day of the week than the regular payroll. At the time of the visit, the typical production worker's pay for 2,080 hours was raised by gain sharing on an annualized basis by \$2,455.

A necessary part of the plan's effectiveness was a reduction in the number of job classifications from 87 to 40 which allowed management more flexibility in re-assigning workers where they were needed. One essential result of the program was a very substantial reduction in the number of defects per unit. At final inspection, where 100 percent of all units produced are inspected, the defect rate was cut by some 83 percent. Since the plan provides gain-sharing pay only for defect-free units, defective units have to be sent back for re-work which uses more labor hours which, in turn, cuts into the pay actually received under gain sharing. The work force soon comes to the realization that quality is a necessary part of productivity.

Gain sharing at the GE plant did not prevent layoffs from occurring as the growth of the market fell from 5-7 percent per year in the 1970s to 1 percent or less more recently. There have been substantial work force reductions on two occasions. Even so, during the period since gain sharing was installed the plant discontinued production of one product line (rubber bushings) and *absorbed* the 42 workers (about 7 percent of the work force) elsewhere. Gain-sharing pay dropped for a brief period but, as these workers were re-assigned to productive work, gain-sharing pay increased.

The GE plant uses some other techniques to enhance productivity such as just-in-time inventory scheduling and teams or quality circles which meet regularly to discuss a wide range of questions and issues. Additionally, the plant has only one lunch room and only one parking area for all employees with no reserved spaces for the top management. However, it is gain sharing that is the centerpiece of the GE program in Shreveport. The company's experience has been that

workers produce more and produce a better quality product when they are rewarded immediately with higher pay.

GE's gain-sharing program reinforces all three organizing principles, social values, and duties under economic justice. Paying each worker in proportion to the hours he/she actually worked fosters competition, individual freedom, and equivalence. Because production is a group enterprise, counting only defect-free units promotes cooperation, teamwork, and contributive justice. Splitting the gains on a 50-50 basis is interventionist and reinforces equality and distributive justice.

Seen from the perspective of the company, GE's innovative program is more inward-looking than outward-looking, that is attention focuses primarily on the workplace rather than the marketplace. The program combines elements of both activating principles for organizing economic affairs -- competition and cooperation -- and for that reason reflects both gender traits - - the masculine and the feminine. Of the two pairs, however, there appears to be more reliance on cooperation and the feminine trait than on competition and the masculine trait.

System Refinement Teams: Martin Marietta Manned Space Systems¹

Martin Marietta Manned Space Systems (MM) in New Orleans manufactures the external fuel tank for the space shuttle. The company innovated a continuous improvement environment where, through the utilization of system refinement teams (quality circles), the cost of production is systematically reduced at the same time the quality of the output improves.

At the time of the site visit, MM employed 4600 - 4700 persons almost all of whom worked on the external tank. The contract with NASA at that time called for production at the rate of one tank per month. The tank was delivered by barge to the Kennedy Space Center in Florida or to Vandenberg Air Force Base in California via the Panama Canal.

The production of the external fuel tank is a complex, roundabout process in which three major sections, each 28 feet in diameter, are welded together and, when fully assembled, extend to 154 feet in length. The tank holds the liquid oxygen and liquid hydrogen which are mixed to supply fuel to the orbiter's three main engines. After the system is in orbit, the tank separates from the orbiter and is burned up in re-entry. Thus, one tank is used in every launch.

The specifications spelled by NASA, which in turn reflect the needs of the space shuttle program, routinely demand production work which is performed at exceptionally small

¹ From a site visit to the company's manufacturing complex in New Orleans, Louisiana in 1985.

tolerances (e.g., alignments of 0.040 inches across a 28-foot diameter). Failure may result in a very serious hazard at the factory, since a defective weld, for example, may lead to an explosion when the tank is being tested before shipment. Additionally, a defect may compromise the mission which utilizes the tank as with the tragic Challenger accident in January 1986.

Producing the tank successfully demands a vast array of technical and managerial skills of the highest order. To simplify, MM is committed to on-schedule delivery of the tank on an 84 percent manufacturing improvement curve which means that as production doubles, the cost per unit drops by 16 percent. For example, the second unit produced costs 84 percent of the first unit; the fourth unit costs 84 percent of the second. The two parties agreed that the baseline cost would be the cost of the first tank produced following the first six developmental tanks. During the production of the first 14 tanks, MM was able to reduce the curve from 84 percent to 68 percent. At the time of the site visit, MM had delivered every one of the 22 tanks completed on schedule including five which were 16 or more days ahead of schedule. On average, these tanks were delivered 11 days ahead of schedule. Five years prior to the site visit, MM installed a zero latent defects program to reduce the number of anomalies which are not identified before delivery. By 1985 this program had detected and eliminated some 1,567 latent defects, a 98 percent reduction.

There are two main elements in MM's cost reduction program: producibility/productivity and work force motivation. Producibility/productivity is a cost-reduction program which has a direct impact on manufacturing labor, material, and support and overhead labor. One key aspect of the program is based on the proposition that substantial savings can be achieved over the lifetime of the external-tank program if certain non-recurring costs associated with redesign and process changes are permitted at the start of the program. By allowing MM to draw on a pool of approximately \$20 million from NASA, MM was able to reduce the cost of producing the first 54 tanks by more than \$90 million and to return those savings to NASA. At the same time, MM was allowed to retain an award fee on the savings achieved under this program.

More than 50 percent of the cost of the external tanks is tied to procurement. Re-opening competition among vendors for items to be purchased has been a significant source of savings. Changes in the production processes are another source of cost reduction. A productivity committee which meets bi-weekly and is made up of senior members from every department recommended changes to the executive management of MM. During 1984, for instance, 14 major projects of this type were implemented. One such improvement was a switching to high-pressure sodium lighting throughout the factory which reduced energy costs by more than \$220,000 per year. The incentive for MM is a 1984 agreement with NASA that for improvements involving a change in specifications the contractor retains 25 percent of the savings over a three-year period and receives a royalty payment on follow-on contracts.

There are three main elements in MM work force motivation program: employee suggestion system, system refinement teams, and motivational programs. The employee suggestion system addresses improvements to product quality, productivity, safety, schedule, and cost. It provides employees an opportunity to present suggestions for improvement and, when implemented, gives recognition to and rewards the individual or team for the savings achieved. Suggestions made outside the employee's own area of work assignment, in general, qualify for a cash award. High-level salaried employees are not eligible. In 1984, there were 2,309 suggestions made of which 608 were adopted. The first-year net savings to MM were estimated to be \$258,691.

System refinement teams, MM's term for quality circles, are small groups of employees and supervisors who voluntarily form teams to identify work-related problems, recommend solutions, and monitor the effectiveness of the implemented improvements. System refinement teams first began in 1979 and by the end of 1984 there were 96 teams at MM covering 23.2 percent of the work force. Of the 96, a total of 82 were organized around a single work area, five addressed problems of the various functional departments related in a common work process, six were involved in a major production process, and three were teams made up of department directors and their unit managers.

During 1984, 110 improvement projects were completed by system refinement teams relating to cost avoidance, quality improvement, safety, schedule and productivity, and procedures and work methods. The outstanding team for the year was rewarded with a trip to see a shuttle launch. The other finalists for this award are recognized at a luncheon. MM is convinced that system refinement teams succeed only if they are seen as part of the existing line of authority rather than a second, competing line. Motivational programs at MM include manned flight awareness, and awards and recognition. Manned flight awareness attempts to instill an awareness of the critical end use of the external tank. This is accomplished by various methods including visits to the facility by the astronauts.

Awards are made at three levels of performance: supervisor recognition of specific job performance, manager recognition of outstanding sustained performance, and director-level and above or NASA recognition of an employee's special contribution. Other awards are presented to the employee of the month and the employee of the year. Additionally, there are Silver Snoopy awards and peer recognition awards. Spot awards which involve commendation and cash are made for significant outstanding performance. More than 1,850 performance awards were presented in 1984. MM also honors its subcontractors and its vendors' employees with various performance awards including a visit to the Kennedy Space Center for a shuttle launch.

MM has a strong skill-training program to prepare its employees for their current work assignments and to advance them along a career path. Production workers are subject to

certification and recertification. Welders, for example, are trained for 2,929 hours at the entry level, for 3,185 hours after the entry level, and 1,050 hours for recertification. MM provides reimbursement for training and education received off the job.

MM's system refinement teams reinforce all three organizing principles, social values, and principles of economic justice. Competition and equivalence are encouraged by offering a trip to the Kennedy Space Center as a reward for the best teamwork in the plant. Since teamwork also strengthens individual skills and work habits, the individual members of a successful team have greater freedom in deciding to remain in their present work roles or to seek out other work roles even with other employers. Cooperation, teamwork, and contributive justice are reinforced by focusing on the importance of producing a zero-defect unit at a lower unit cost. Intervention, equality, and distributive justice are enhanced through the leveling effect that system refinement teams have in terms of the responsibility among supervisors and subordinates for work which is being produced in a given area.

Thus MM is an example of a company in which workplace entrepreneurship is activated by elements based on the competitive organizing principle and its associated masculine gender trait along with parts based on the cooperative organizing principle and the feminine gender trait.

*Innovation, Quality, Service (IQS): Stone Container*¹

Stone Container Corporation (SC) has operated a paper mill and bag plant² in Hodge, Louisiana since 1983 when both were acquired from Continental Forest Industries. Since acquiring the mill, SC has expended roughly \$40 million on environmental cleanup: \$10 million on air quality and \$30 million on water quality.

The center of SC's productivity-and quality-improvement program is not capital expenditures, however. Neither is it a wholesale housecleaning of the senior-management ranks. Over the five-year period between SC's acquisition of the paper mill and the site visit, the same senior management generally remained in place. Rather, the heart of the company's improvement in quality and productivity is its Innovation, Quality, Service (IQS) program which was developed at the corporate level in 1979-1980.

Paper making is not a high-tech business. One of the four machines producing paper at SC was installed in the late 1920s. Work is organized in such a way that production workers cannot leave

¹ From a site visit to the paper mill in Hodge, Louisiana 1988. It has since been acquired by Smurfit.

² The two are managed separately; only the paper mill is covered in this account.

their work areas for a coffee break for lunch. They are paid very well especially by Jackson Parish standards. Top pay exceeds \$40,000 per year. The employees, however, work in a very noisy, hot, and humid environment.

SC seeks to achieve three goals with IQS: (1) to increase production, (2) to cut the number of complaints about the product to zero, and (3) to reduce lost-time accidents to zero. Central to the IQS program at the mill over the two-year period 1987-88 has been the introduction and gradual improvement of monthly in-house video reports. These reports cover the various departments of the mill and contain a special feature (e.g., a local physician was taped in his office on the subject of AIDS). Each department in the mill has a one-hour IQS meeting every month, featuring the video. Included among its applications are safety and training. The use of in-house videos is a Hodge paper mill innovation. Every month a mill-wide committee selects one person as IQS employee of the month. In 1988 the mill had an employee survey conducted by a company in New Jersey. One finding that was particularly noteworthy was that a majority of the employees regard SC as one of the best if not the best place to work.

The senior management characterized the SC management system as decentralized in sharp contrast with the centralized management system in place under Continental Forest Industries. Once a month, for example, the plant manager holds a meeting to which anyone in the mill may come. However, only a few employees per month avail themselves of this opportunity to address the plant manager directly.

Two main sources of an 18 percent reduction in unit cost since 1983 were identified: purchased energy use and productivity. Energy costs have been reduced largely through improved utilization of self-generated energy equipment. At the same time, overhead costs have increased substantially as a percentage of cost per ton, largely because of hikes in insurance costs along with some changes in bookkeeping. Output rose by 23 percent between 1983 and 1987 and cost per ton fell by \$59, yielding an overall savings of \$38 million per year. These results were accomplished with no essential change in employment levels since 1984.

Roughly two-thirds of mill output (in tonnage) in 1987 was used in the production of bags and sacks. This is down only slightly since 1983. Most of the output -- 72 percent -- is shipped to other SC plants. The balance is shipped to other customers. This represents a shift in marketing distribution since 1983 away from "trade" and toward in-house utilization. Approximately 70 percent of the mill production is shipped by rail; the rest is moved by trucks.

In 1983 the paper mill had 46 complaints about the product. By 1988 complaints fell to 12; some of these complaints led to paper being shipped back to the mill for recycling. The usual method for dealing with a complaint is to make a price adjustment or refund without requiring the

customer to ship the paper back to the mill. In 1988 the paper mill spent \$35,000 on financial adjustments for shipments to customers who were not satisfied with the product.

In 1983, the SC bag plant in Hodge shipped back 646 tons of paper to the paper mill (the two plants operate literally side by side). Four years later, only 115 tons were returned by the bag plant. The paper mill itself rejects about 1 percent of total production for being off specification.

Seven percent of the paper mill's maintenance effort is focused on safety. The mill's safety performance is 0.8 percent OSHA-reportable accidents per 200,000 labor hours. The senior managers affirmed that the mill's safety record had been good even before the acquisition by SC.

The senior management attributed the improvements in production, quality, safety, and efficiency to the company's IQS program. The SC senior managers exhibit a highly participatory style. Open and honest communications, training, and teamwork are stressed. The philosophy of the group could be described in these terms: we're all in this together, we all work for our customers, and positive attitudes are at the core of being a successful team. The relationship between the senior management and the employees is impressive. Generally, the senior managers know employees by their first name and were proud to introduce employees to the site visitors, where possible.

There are two principal innovations at the SC paper mill in Hodge. By acquiring the paper mill, the company moved further upstream in terms of the process of producing paper. By implementing IQS it changed the way work is organized and rewarded. The first innovation is reflective of the organizing power of the competitive principle along with its associated social value of individual freedom. The second innovation involves a greater utilization of the principle of cooperation and its associated social value of teamwork or community in organizing the workplace. Indeed, mill's motto is "At Hodge, Teamwork is the Difference." Thus, innovation at the Hodge paper mill blends elements of both the masculine gender trait of aggression and the feminine gender trait of nurturance.

Production/Sales Partnership: Cameco Industries¹

Cameco Industries (CI) is a manufacturer of specialized equipment for harvesting sugar-cane, pineapples, and trees. Faced with deteriorating market conditions for its standard harvesting equipment, the firm innovated the development of a tree-harvesting machine and the construction of a new plant to house an assembly-line production process to complement its original plant with its stall-build process.

¹ From a site visit to the company's manufacturing facility in Thibodaux, Louisiana in 1992.

CI was incorporated in 1965 to manufacture and sell sugar cane harvesting and handling equipment. From the very beginning, the company has sold most of its production in foreign markets. In 1973 CI opened a shop in Mississippi to access the larger labor supply available there, a spare parts depot in Paris to service its markets in Africa, and an office in Holland for close contact with customers in Europe, the Middle East, and Africa. In 1979, the company bought a competitor in Jeanerette, Louisiana, and had ventured into the oil industry effectively linking the company's fortunes to the price of sugar and the price of crude oil.

Retrenchment in oil prices began in 1982 and one year later the price of sugar began to fall. Later, the facility in Mississippi was permanently closed and by early 1986 total employment at CI had dropped by roughly two-thirds from the high reached in 1982. In response to serious deterioration in both of its markets, the company decided to venture into the forestry market in 1985 and into the pineapple market two years later. The company has grown since 1987 and by late 1992 employment had climbed to within 85 percent of its 1982 peak. The most recent information available indicates that 60 percent of its business derives from equipment sales to sugar growers, 33 percent comes from the forestry business, and the remaining 7 percent comes from pineapple growers.

Central to CI's success in entering the forestry market is an exclusive contract with John Deere to mass produce a tree harvester which CI already had developed. Under the terms of the contract, CI is responsible for the design, engineering, manufacturing, and warranty of the tree harvester. John Deere is responsible for sales and service. This is the first time that CI has surrendered control of its product at and after the point of sale.

The tree harvester is called the “feller-buncher” because it has two main operating modes: felling trees and bunching them so that they can be stacked. Prior to this contract, CI earned its reputation in the equipment business as a manufacturer of one-of-a-kind products. The contract with John Deere eventually forced CI to modify the production process from an exclusively stall-build system where the product remains at one station or stall from start to finish to an assembly-line where the product moves from station to station.

Early on in the partnership with John Deere warranty costs threatened CI's profitability. A quality improvement team was established in 1988 as a joint venture with John Deere to address and solve the quality problems and to reduce the high cost of warranty claims. The main problems were in the areas of design and manufacture. Between 1989 and 1991 CI was able to reduce this cost by 66 percent and now its cost is lower than the accepted warranty cost for forestry equipment.

As to productivity, it is instructive to examine CI's SP 1800 four-wheel-drive self-propelled cane loader, which was originally designed in 1967-68 and which CI officials identified as the company's standard flagship product. More than 2,500 SP 1800s are operating around the world. The labor hours embodied in the machine dropped by more than 50 percent after production was moved from the company's plant in Mississippi and consolidated at its facility in Thibodaux. The main reasons for this improvement were the switch from a stall-build process to an assembly-line process, an increase in the size of the production runs, and the utilization of computer numerically controlled (CNC) machines which greatly reduce set-up time, and cell manufacturing.

In 1990, CI hired Deere Technical Services to assist in a company assessment of its past and present performance and its future goals. Over a three-month period, a team consisting of two persons from Deere Technical Services and eight CI employees selected from various departments formulated a master plan covering all phases of production. This plan recommended that the company adopt the focused factory and the cell manufacturing systems. In addition, it suggested that the company either (1) build an entirely new, much larger facility to house all of its production and close down the old plant or (2) build a smaller facility and continue operations at the old plant. CI decided to build Plant 2 and to continue operations at Plant 1.

Plant 1 is set up under the old stall-build production process and is dedicated to one-of-a-kind products. The plant operates with two supervisors: one for fabrication and another for assembly. CI uses a just-in-time system for 20 percent of the parts which account for 80 percent of the purchasing for repetitive products. The adoption of the focused-factory system has allowed CI to implement point-of-use storage of inventory which in turn has reduced material handling by 50 percent.

Plant 2, which was completed in summer 1992, is set up under the new line-build production process. The feller-buncher under contract to John Deere is produced in Plant 2 in a lot size of five. Another product, the CH 2500 chopper harvester used to harvest sugar cane, is produced in a lot size of four. The plant operates with one supervisor, one-half of the supervision required in Plant 1. Throughput time for the feller-buncher is 60 working days in Plant 1 compared to 12 days in Plant 2. Similar results are achieved with the chopper harvester. Reduced throughput time leads to (1) improved cash flow, (2) lower inventory levels, (3) smoother material flow through the factory, (4) reduced work in process, and (5) a higher quality product.

At CI, quality improvement has been a joint venture with John Deere since 1988 in which a team made up of two engineers, one service technician, and two production supervisors from CI and two engineers, two service technicians, and one purchasing specialist from John Deere meets every Friday by conference call. The quality improvement team (QIT) addresses all quality

problems whether they occur in the field or during manufacturing by means of action plans. The work of the QIT is carefully documented. The company also has a production quality improvement team (consisting of four members from different departments) that analyzes and discusses assembly defects and assigns responsibility for corrective action.

As heavy equipment manufacturers, CI and John Deere normally would see one another as competitors. However, by focusing on defects, their partnership benefits not only the two partners but the customer as well. Further, their partnership opens a much wider market for CI, allowing the company to switch to the more efficient line-build production process and to pass some of the savings on to its customers in the form of lower prices.

This inter-firm partnership between CI and John Deere helps both manufacturers meet their obligations to the final customer under the principle of equivalence. Additionally, CI has engaged successfully in both workplace and marketplace innovation. The development of the “feller-buncher” is outward-looking innovation of the masculine type driven by the activating principle of competition. The use of assembly-line production methods to manufacture the “feller-buncher” is inward-looking innovation of the feminine kind driven by the activating principle of cooperation.

FINAL REMARKS

Personal Dimensions of Innovation.

In a market economy, two organizing principles activate economic activity. The principle of competition energizes economic affairs in the workplace and the marketplace by means of a disposition on the part of the individual to perform certain tasks through individual action motivated by individual rewards. The principle of cooperation mobilizes the economy by means of a disposition on the part of the individual to undertake certain tasks through collective action because those tasks cannot be completed at all or as well by individual action alone. As for marketplace dysfunctions such as shoddy merchandise and apathetic customer service and workplace dysfunctions such as accidents and rework, collective action is as natural a remedy as individual action for the simple reason that humans are no less social beings than individual beings.

Competition is grounded in the social value of individual freedom in that competition flourishes only where individual freedom is prized. Cooperation is grounded in the social value of community or teamwork in that cooperation thrives only where community or teamwork is esteemed.

A market economy is continuously changing in response to the driving energy of the entrepreneur. This change is at once creative and destructive: creating new goods and services and processes of production and destroying old ones; utilizing new or different materials in the process of production and casting aside old materials; opening up new markets at the same time closing down or moving out of others; developing new methods for organizing economic enterprises and scraping older organizational arrangements.

Being at once creative and destructive, entrepreneurial change disrupts economic processes improving economic security at least temporarily for some persons and undermining it for others. The impact on the person is both direct and indirect. On the destructive side, for instance, a major change directly affects those who become disemployed and indirectly influences those whose trade depends on the disemployed. From the human perspective, innovation clearly alters human relationships as, for example, between buyer and seller, producer and resource owner, employer and employee. Changes in those relationships likely include changes in their duties and obligations to one another in the workplace or the marketplace.

A business establishment operating in a market economy achieves its central objectives in one of two ways. Either the firm relies entirely on competition and individual freedom in the workplace and the marketplace or it blends competition and cooperation, individual freedom and teamwork, to organize work and sell its product.

Competition and cooperation are alike in that both have a positive side and a negative side. Competition can be either constructive or cutthroat. Cooperation can be either productive or collusive. The dark side of each one has the same general purpose and effect: to amass economic gains by inflicting economic losses. Both are shameful. As to the bright side, conventional economics applauds and embraces the constructive outcomes of competition. It says virtually nothing, however, about the productive consequences of cooperation. In other words, even though anyone familiar with the modern workplace knows firsthand that work on a daily basis is organized importantly by means of cooperation, mainstream economics pigeon-holes all cooperation as collusion.

Positive-sum cooperation operates in three distinct organizational settings: intra-firm, inter-firm, and supra-firm. The meaning of intra-firm cooperation is self-evident. Inter-firm cooperation or partnership refers to cooperation between two or more individual firms in which there is no separate organizational structure to the cooperating relationship. Supra-firm cooperation or alliance refers to cooperation of the same type in which the relationship is structured around a formal organization. Some firms are beginning to understand that more intra-firm, inter-firm, and supra-firm cooperation can be effective in helping them become or remain competitive in the marketplace especially in competition with foreign producers.

An alliance can be classified as either area-specific or industry-specific. That is, the formal organizational structure draws in firms that function in the same industry or that operate in the same local area. This author's experience suggests that in the case of industry-specific cooperation, the cooperating firms continue to compete in the product market. Of course, if they stop competing in that market, the cooperation degenerates into collusion but an outcome such as that is not inevitable. In the case of area-specific cooperation which involves firms from different industries, the cooperators may compete in the product market and probably compete in the resource market, particularly the labor market. As long as human beings are free to act and are willing to act in accordance with the demands of justice, group action need not dissolve into conspiracy.

Alliances and partnerships are entrepreneurial because both represent a change in the way economic affairs are organized and conducted. In the United States, for sure, such changes evoke the usual resistance that all entrepreneurs encounter. The successful entrepreneur understands at least at the instinctive level that cooperation is not a substitute for competition and that cooperation is not possible without striking a new balance between the sociality of human beings and their individuality.

Ethical Dimensions of Innovation.

Workplace and marketplace innovations typically raise various ethical issues because innovation precipitates changes as to the goods and services produced, the processes by which and the materials from which goods and services are produced, the markets in which the goods and services are exchanged, and the management structures by which work is organized and supervised. Such changes alter the relationships between parties such as supervisor and subordinate in the workplace and producer and consumer in the marketplace resurrecting certain ethical questions such as: What is the firm's duty to its customers in matters of pricing?, What does it owe its employees who help to develop and produce new products or services? Because workplace and marketplace innovations unsettle old human relationships and likely change one's duties and responsibilities in economic affairs, entrepreneurship is intertwined with ethics.

A written code of business ethics is only one expression of a company's concern for ethical business practices. A code by itself does not guarantee that the company's employees will behave in an ethical manner in their business affairs. Indeed, a code is futile whenever the company's officials and employees have lost their sense of moral duty, whenever they have become moral relativists, whenever they affirm situation ethics.¹ A company's real concern for ethics is not so

¹ See Edward J. O'Boyle and Lyndon E. Dawson, Jr., "The American Marketing Association Code of Ethics: Instructions for Marketers," *Journal of Business Ethics*, pp.923-924.

much a matter of what it says but how its employees and officials conduct themselves. The author's experience in making more than 50 company site-visits suggests the following.

Innovation at the level of the individual enterprise to improve quality and productivity is designed to make the company more successful in the marketplace through a re-affirmation of or a change in emphasis on competition, cooperation, and intervention. Constructive competition is encouraged by stressing a person's duty under the principle of equivalence whereby the responsible free person understands that, in order to merit the maximum reward, his/her best work is required. Similarly, constructive cooperation is enhanced by stressing a person's duty under the principle of contributive justice. Under contributive justice, the true team member knows that, in order to preserve cooperation, he/she must contribute to the success of the team. Intervention is emphasized through the principle of distributive justice wherein the authentic democratic accepts that equals are to be treated as equals.

Successful companies instinctively make these connections between the organizing principles and the ethical principles because it works for owners, for customers, and for employees and, insofar as they are models for other companies which are faced with similar problems of quality and productivity, those other companies instinctively make the same connections for the same general reasons: to serve their own constituencies better and to better ensure their own survival in the marketplace.

In the end, entrepreneurial improvements are possible in a market economy only by means of a re-affirmation of a personal sense of obligation because virtually nothing is produced without human labor and, for that reason, nothing is improved without some change in human beings. One of the principal keys to changing humans is spelling out more clearly and specifically what they owe to others in their various economic roles as buyers and sellers, employers and employees, producers and resource holders.

Masculine/Feminine Dimensions of Innovation.

The skills for entrepreneurial activity derive significantly from and are determined importantly by a person's masculinity and femininity. Masculinity is a dominant driver for introducing a new good or service, and for opening up a new market. Femininity is the governing force in developing a new production process, utilizing a new or different material in the production process, and designing/implementing a new organizational model.

The male's biological and psychological need to prove to himself that he is not female, to prove his individuality, is worked out in part through the rough and tumble competition of the world of commerce. Thus, entrepreneurship pursued competitively in the marketplace tends to be a

masculine thing. The female needs no such differentiation and therefore is more disposed to incorporate, to harbor, to keep. It follows that entrepreneurship pursued cooperatively in the workplace tends to be a feminine phenomenon. Further, the entrepreneur who is successful in both the workplace and the marketplace is a person with an endowment of both masculine and feminine qualities.

The entrepreneur is not as rare as Schumpeter suggests¹ because entrepreneurship is one means by which humans work out their masculinity and femininity. Moreover, entrepreneurship cannot be bureaucratized, as Schumpeter suggested, because it is fueled by human sexuality.

Specific Lessons.

This section draws one, short lesson from each one of the 18 companies featured in LOUISIANA WORKS!. The same order of presentation is employed here as is used earlier in the text.

In health-care, leading-edge technologies typically are controlled by university medical centers largely by means of large and prestigious basic science and clinical science faculties. **Terrebonne General Medical Center** is proof that given the right clinical resources a community hospital operating in a predominantly rural area can deliver leading-edge health care in a delimited subspecialty.

Acadian Ambulance is especially adept at finding innovative ways to mobilize the community's resources and to blend them with the company's own resources in a cooperative system which delivers state-of-the-art emergency medical care across a vast low-income area which otherwise is quite difficult to service.

Thibodaux Hospital and Health Centers innovated a community hospital facility with state-of-the-art health services in five delimited areas in order to survive in a competitive health-care delivery environment. As with any organization which faces competitors, a miscalculation along the way could be fatal.

Market forces can push a company to undertake two major types of innovations simultaneously, one which is external to the company and one which is internal. In this case, **Bollinger Machine Shop and Shipyard** was forced out of a declining civilian market and was able to successfully penetrate the national security/law enforcement market. At the same time, it innovated a major

¹ Joseph A. Schumpeter, *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, New Brunswick: Transactions Books, 1983, (with a new introduction by John E. Elliott), p.81.

change in the process of production.

At the risk of oversimplification, innovation in some cases is a matter of a team of individuals working together and making change happen. In others, it is a matter of a single individual who is specially gifted. Laney Chouest of **Edison Chouest Offshore** is an authentic Schumpeterian knight-in-armor entrepreneur.

Textron Marine and Land System's success to date as an innovator lies in adapting the air-cushion vehicle from a civilian market to a military market and in building the new vehicle not by the usual shipyard methods but by aerospace techniques instead. The company's future depends on successfully innovating its military vehicle back into a marketable civilian product.

John Chance and Associates teaches that entrepreneurship is not for the faint of heart. At times, the market presents this dilemma: innovate and risk losing everything through failure or stand pat and risk losing everything through inaction.

LOOP is an authentic engineering marvel. However, LOOP would have been impossible without another marvel: a formal cooperative ownership and control agreement in the resource market between companies which continue to compete in the product market.

In the face of the fierce competitive forces unleashed by the deregulation of the telecommunications industry in the early 1980s, the management of the **AT&T** manufacturing facility in Shreveport innovated a complete internal makeover in the mid and late 1980s which left intact the plant's product line but, borrowing heavily from Japanese manufacturing experience, profoundly changed the process of production.

Matthew Stuller innovated a company in Louisiana to manufacture gold jewelry for distribution directly to retail jewelry stores. Prior to **Stuller Settings**, success in this business meant operating out of New York City. Stuller demonstrated that success is not determined by location. No doubt, he would have been a success in Kokomo or Keokuk.

Amerchol introduced a cultural change in the workplace based most fundamentally on trust. To help implement this fundamental change, Amerchol relied heavily on the organizing principle of cooperation and its associated social value of teamwork. It was not the survival of the company which was the driving force behind Total Quality Process but overall month-to-month improvement in its performance.

The second-generation management of the family-owned and operated **Wemco** boldly redesigned the men's neckwear company so that it operates like a women's apparel

manufacturer. For years, the company's fortunes rested on ties which were replaced when they wore out. Today, its fortunes rest on ties which are replaced when they are out of fashion.

Harmony Corporation installed an in-house developed computer system to reduce the time to prepare a final bid for a project, refine its estimate to more closely approximate the actual cost of the project, purchase the needed materials and hire workers with the appropriate skills for the work at hand, track progress and efficiency in the field by the field project manager using detailed information received from the various crew foremen on the job as to the specific work which has been completed, prepare a more accurate progress report for its client and corporate headquarters and minimize the inputs used on the project, and measure the efficiency of its foremen.

Temple-Inland Forest Products implemented a five-part Deming-type improvement program: (1) structured hiring interviews for a more stable, team oriented workforce; (2) team incentive plan to achieve goals which require a “stretch”; (3) quality improvement which organizes work around area, task, and lead teams; (4) operations improvement to enhance safety, quality, and productivity; and (5) continuous process improvement to eliminate waste.

In order to become more competitive in the marketplace, **General Electric** innovated in its workplace a gain-sharing plan to evoke improvements in the quality and the cost of production of its industrial products. Innovation at General Electric has been inward-looking more so than outward-looking.

Innovation at **Martin Marietta** took the form of a continuous-improvement program in the workplace which improved the quality of production of the external fuel tank for the space shuttle, thereby reducing the cost of production and enhancing the safety of the shuttle crew and ground-support personnel. There has never been a fatal accident attributable to a defect in the tank produced by Martin Marietta.

From the perspective of the parent organization, there were two innovations achieved through the purchase and the day-to-day operations of the **Stone Container** paper mill in Hodge, Louisiana. First, the purchase of the mill moved the entire organization further upstream in the paper production process. Second, the implementation of the IQS program changed the way work at the mill was organized and rewarded. The first innovation is reflective of the competitive organizing principle. The second involves greater reliance on the cooperative principle to organize the workplace.

Two principal changes -- one oriented toward the marketplace, the other toward the workplace -- characterize innovation at **Cameco** Industries. The first was the development of a tree-harvesting

machine which was driven by the organizing principle of competition. The second was the construction of an entirely different method of assembly which was driven by the organizing principle of cooperation. The immediate future depends directly and importantly on how long these two innovations differentiate Cameco Industries from its competitors.

General Lessons.

Ten general lessons about entrepreneurship and the entrepreneur derive from the more than 50 site visits to finalist companies for the Innovation Award and the Productivity Award.

1. There is no entrepreneurship without the entrepreneur acting either competitively and therefore as the Many or cooperatively and therefore as the One. An effective manager, in turn, knows that the success of the company is a function of both its competitiveness in the marketplace and its teamwork in the workplace.
2. Innovators are creative but even more so they are uncommonly persistent in the face of resistance and criticism, even from their supervisors and peers.
3. Following from the first two lessons, innovations are a new source of profits and are as numerous, varied, and fascinating as the humans who champion them.
4. Innovation may come in the form of one large change or many small changes. In large companies, even when it involves a team of individuals, innovation requires a champion.
5. Innovation is necessary for the survival of the firm in an ever-changing market economy. Thus, entrepreneurs are powerfully driven to act by the threat of financial ruin and the seemingly impossible complexities of the task at hand in a way which is reminiscent of Newton's third law of motion: for every action, there is an equal and opposite reaction.
6. Entrepreneurship rarely takes the form of just one of the five types of innovation enumerated above. More often, innovation comes in combination. Introducing an established product in a new market, for example, likely leads to some change in the way the enterprise is organized.
7. For virtually every good and service produced, there is a way to enhance quality and improve productivity because in every company workforce there are individuals who are not functioning at their full potential. Skillful managers organize working environments where every worker has an opportunity and a reason to make his/her maximum contribution.

8. Companies compete not only in terms of price but also in terms of innovation. Thus, successful companies are efficient and careful in using their resources and, at the same time, creative and persistent in implementing change.

9. Although at times it is remarkably serendipitous, innovation ultimately is grounded in human material need, both physical need -- the need for food, shelter, clothing, and the like -- and the need for work as such -- the need to express one's self and the need to belong.

10. Finally, and consistent with a personalist philosophy that underpins what has been said to this point, entrepreneurial activities for better or for worse leave two distinct imprints: one on the innovation itself and the other on the innovator. The overall importance of entrepreneurship in economic affairs and in human terms suggests which the imprints left on the innovator are far more significant than the imprints left from routine work. Entrepreneurship, therefore, is one means by which a human being becomes more fully a human person.

APPENDIX A

The Selection Process.

Most fundamentally, both Awards reduced to selection factors and people. Of the two, the people were the more important. The selection process got underway with a commitment by the two U.S. Senators to identify and publicly recognize outstanding achievements in the areas of productivity and quality improvement and innovation.

The most important decision which the Senators made at this point was the selection of the persons to advise them as to which firm(s) actually made such improvements and merited the Productivity Award or the Innovation Award. The tenure of the Board members was not fixed. Old members resigned and new members were appointed whenever appropriate or necessary. In Louisiana, the managers of the firms which won the Awards were invited to serve on the Board. This practice contributed importantly to the prestige of the Award because the recipient was named in effect by the “best” firms in the State. The recipients were pleased to serve in this capacity because it allowed them an opportunity to observe first hand productivity-and quality-improvement developments, along with innovational activity, in other industrial settings throughout the State.

The first task for the Board was to inform private employers in the State about the both Awards and to urge them to inquire about and apply for them. A letter prepared by the staff for the signature of the two U.S. Senators which was sent directly from their Washington offices to every private employer in the State worked quite well. The Board tried using the media for soliciting interest and the results did not compare favorably with a letter directly from Washington. In effect, the letter was the Board's “clout” with employers.

When an employer expressed an interest one of the Awards, an initial application form was sent along with a listing of Board members and some biographical information about each one. This reinforced the prestige of the Awards by calling the applicant's attention to the people who would be reviewing the materials which were presented for the Board's examination.

The information from the initial application form was the basis for selecting the finalists. From the pool of applicant firms, three or four finalists were selected for a site visit which was pre-arranged with the finalists. The site visit was the critical element in the selection process (see critical selection factors listed below). A team was made up of two or more members of the Board who volunteered to visit the finalist on a designated day and afterwards prepared a written report on what they had seen. Different teams were assembled for these visits in a way which distributed the workload among the various members of the Board. Copies of the site-visit

reports were circulated to every member of the Board. The Board tele-conference to select a firm which it recommended for the Awards to the Senators who, in turn, notified the firms which had been designated the winners for that year. A suitable presentation ceremony was arranged by the recipient in consultation with the two Senators and the Board.

Critical Factors in Selecting an Award Recipient.

In selecting a suitable recipient for the Productivity Award, the Board looked at the following six factors:

1. specific productivity-and quality-improvement program which has been put in place.
2. driving force behind the program.
3. nature and extent of senior management's commitment to productivity and quality improvement.
4. involvement of the company's work force in the program.
5. impact of the program on owners, managers, employees, customers, and vendors.
6. transferability of the productivity- and quality-improvement program to other private-sector business, particularly in the State of Louisiana.

For the Innovation Award, the Selection Board looked at the following critical factors:

1. specific innovational activity undertaken.
2. driving force behind this activity.
3. nature and extent of senior management's commitment to this activity.
4. involvement of the company's work force in this activity.
5. risks taken in developing this specific innovation.
6. impact of this activity on owners, managers, employees, customers, vendors, and competition.
7. transferability of this specific innovation to other private-sector businesses, particularly in the State of Louisiana.

Board Members.

The following 22 persons served on the Selection Board during its lifetime.

Paul Baker, AT&T 1991 - 1994

Richard Bollinger, Bollinger Machine Shop and Shipyard 1987 - 1995

Marion L. Burn, Stone Container Corporation 1989 - 1995

Eleanor Cameron, Cameron Business College 1984 - 1995

Don Chaisson, Competitive Edge 1985 - 1995

Laney Chouest, Edison Chouest Offshore 1991 - 1995
Ric Davis, Martin Marietta Manned Space Systems 1986 - 1992
Roland Dugas, Acadian Ambulance 1992 - 1995
Joseph Giardina, Cameco Industries 1993 - 1995
Tom Gibbens, WAFB-TV 1984 - 1986
Joe Kasparek, John E. Chance & Associates 1990 - 1993
G. Thomas Marsh, Martin Marietta Manned Space Systems 1994 - 1995
L. Frank Moore, Welmoore Industries 1984 - 1987
J. Edward McGovern, AT&T 1988 - 1991
Edward J. O'Boyle, Louisiana Tech University 1984 - 1995
Rich Pfeiffer, Amerchol 1991 - 1995
Alex Smith, Terrebonne General Medical Center 1990 - 1995
Greg Stock, Terrebonne Hospital and Health Centers 1993 - 1995
Grover Strickler, PPG Industries 1984 - 1986
Matthew A. Stuller, Stuller Settings 1990 - 1995
Thompson, LOOP 1993 - 1995
Thomas Wirth, Martin Marietta Manned Space Systems 1992 - 1994

Two persons -- Cameron and O'Boyle -- served on the Board continuously from the very beginning. Baker, Bollinger, Burn, Chaisson, Davis, Giardina, Marsh, McGovern, Pfeiffer, Stock, Stuller, and Wirth were appointed to the Board after their companies had been selected for the Productivity Award. Chouest, Dugas, Kasparek, Smith, and Thompson were appointed after their companies had been selected for the Innovation Award.

APPENDIX B
SITE VISITS AND REPORTS FOR UNITED STATES
SENATE PRODUCTIVITY AWARD AND INNOVATION AWARD
STATE OF LOUISIANA

General Electric, Shreveport, June 1984.
Hibernia National Bank, New Orleans, June 1984.
Public Investors, Alexandria, June 1984.
Martin Marietta Manned Space Systems, New Orleans, October 1985. *
Louisiana National Bank, Baton Rouge, September 1985.
Freeport Chemical, Convent, September 1985.
Bollinger Machine Shop and Shipyard, Lockport, February 1987.
Atlas Processing, Shreveport, February 1987.
AT&T, Shreveport, February 1988. *
Jantzen, Eunice, March 1988.
Cameron Iron Works, Ville Platte, March 1988.
Dresser Industrial Valve, Alexandria, March 1988.
Stone Container, Hodge, December 1988. *
Terrebonne General Medical Center, Houma, December 1988. *
Vulcan Chemicals, Geismar, December 1988.
East Jefferson General Hospital, Metairie, December 1988.
FlexCon and Systems, Lafayette, December 1989.
John E. Chance and Associates, Lafayette, December 1989. *
Stuller Settings, Lafayette, December 1989. *
Motivatit Seafoods, Houma, December 1989.
Acadian Ambulance Service, Lafayette, January 1991, January 1992.
Amerchol, Greensburg, January 1991.
Edison Chouest Offshore, Galliano, January 1991.
Fibrebond, Minden, January 1991, November 1995.
Manville Forest Products, West Monroe, February 1991.
Environmental Remediation, Baton Rouge, January 1992.
Unaform, Shreveport, January 1992.
Textron Marine Systems, New Orleans, January 1992, December 1992, February 1994. *
Sunland Fabricators, Walker, January 1992.
Union Carbide, Hahnville, January 1992.
Sabine Manufacturing, Many, December 1992.
Tru's Joist MacMillan, Natchitoches, December 1992.
Cameco Industries, Thibodaux, December 1992. *
LOOP, New Orleans, December 1992. *

Pan-American Life, New Orleans, December 1992.
Ludlow Laminating and Coating, Homer, January 1994.
Marine Shale Processors, Amelia, January 1994.
Frymaster, Shreveport, January 1994.
Thibodaux General Hospital and Health Centers, Thibodaux, January 1994.
Wemco, New Orleans, February 1994. *
Harrison Company, Bossier City, February 1995.
Cardio-Vascular Institute of the South, Houma, March 1995.
Harmony Corporation, Baton Rouge, March 1995.
Harrison Medical Group, Lafayette, March 1995.
Health Care Options, Baton Rouge, March 1995.
Avondale Industries, New Orleans, November 1995.
Temple-Inland Forest Products, DeQuincy, November 1995. *
Chrisope Technologies, Lake Charles, November 1995.
Prison Enterprises, Baton Rouge & Winnfield, November 1995.
River Parishes Hospital, LaPlace, April 1997.
Louisiana Compressor Maintenance, Houma, April 1997.

*: participated subsequently in formal award presentation ceremony.

