REPORT

OF

THE MANUFACTURING YEAR

2000 TASK FORCE

FOR

THE PACKAGE FOODS OPERATIONS DIVISION

OF

GENERAL MILLS, INC.

January 15, 1987

Summary

The objective of the Manufacturing Year 2000 Task Force was to determine how the Package Foods Operations Division of General Mills, Inc. could gain and sustain a competitive advantage in and beyond the year 2000, thereby creating the greatest sustainable value for General Mills, Inc. Based on the assumption that the Corporation will continue to be as market driven and responsive to customer needs as it is today, the Task Force concluded that PFOD would make its greatest contribution to the success of General Mills, Inc., by being highly responsive to market demands and changes.

The Task Force focused upon four major areas:

a. human resources, culture and organization;
b. hardware, technology and production/distribution process;
c. product and food technology; and
d. marketplace and customer needs.

Substantial amounts of information were collected about each of the four areas through the use of internal and external experts, visits to other companies, and published documents.

The collected data was analyzed in a three step process. The Task Force first identified basic trends in the environment in which PFOD competes or could potentially compete. Second, it determined the implications of the trends. Third, it agreed upon specific guidelines and recommendations that would enable the Division to create a sustainable competitive advantage in and beyond the year 2000. Because of the nature of this analysis, the Report needs to be read as an integrated whole; many of the recommendations and guidelines are meaningful and viable only in the context of other recommendations and guidelines.

The data clearly revealed that the environment in which PFOD would operate will be constantly and rapidly changing. The Task Force did not attempt to predict precisely what the changes will be; rather it concluded that in order to gain and sustain a competitive advantage PFOD must operate as a highly flexible, highly responsive, cost efficient, premium quality manufacturer that embraces change.

The Manufacturing Year 2000 Report identified two areas especially critical to the success of PFOD, and where the willingness to change is vital – Technology and Human Resources. A future of rapidly changing technology is a challenge, but is also an opportunity. The Task Force recommended a flexible, and aggressively innovative

approach to technology. The Report also concludes, however, that without highly motivated, highly committed employees, employees who accept and adapt to change, the full benefit of the new technologies will not be achieved.

Ultimately the Task Force believed that the most valuable asset of PFOD is its people. If the company understands and utilizes its human resources, then the people of PFOD will rise to meet the challenge of change. People are the one constant in the dramatically changing world of the twenty-first century.

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INTRODUCTION

Predicting the future is an exercise in futility; preparing for the future is essential. The Manufacturing Year 2000 Task Force recognizes that detailed predictions of the distant future are unreliable, but believes that by observing basic trends, recommendations can be made that will enable the Package Foods Operations Division (PFOD) of General Mills, Inc. (GMI) to compete successfully in the uncertain future.

The Task Force

The Manufacturing Year 2000 Task Force was established in autumn, 1985. Its ten members consisted of five hourly members of the American Federation of Grain Millers and five salaried employees. The Task Force was a vertical cross-section of the organization, including operators, union officials, a first line supervisor, a department manager, a plant manager, and support staff, from all six of the major PFOD production facilities and from Division headquarters. Co-chairmen from the Company and the Union were selected. An external consultant was selected by the Task Force to advise and to facilitate the process.

Task Force Members

Co-Chairman Harry Gandre	Plant Engineering Manager, Toledo
Co-Chairman Tom Frain	International Representative, A.F.G.M.
Harold Barnett	Packaging Operator, Toledo
Herman Darrow	Maintenance Supervisor, Cedar Rapids
Ron Hutton	Maintenance Mechanic and Local Union President, Lodi
Ken Knipe	Industrial Relations Representative, Minneapolis
Clyde Parrish	Packaging Maintenance Mechanic, West Chicago
Roy Poss	Plant Manager, Toledo
Rufus Suhrke	Operation Services Engineer, Buffalo
Don Thompson	Production Operator, Buffalo
Consultant:	
Dr. Thomas J. Schneider	President, Restructuring Associates Inc., Washington, D.C.
Emily P. Munro	Associate, Restructuring Associates Inc., Washington, D.C.

The Task Force was assisted by Brent Adair, Manager,

Project Management and Bob Malecki, Planning Manager, PFOD.

The Mission

The Task Force defined its mission as the following:

to determine what General Mills, PFOD, should do to gain and sustain a competitive advantage in and beyond the year 2000 considering:

a. human resources, culture and organization;

b. hardware, technology and production/distribution process;

c. product and food technology; and

d. marketplace and customer needs.

The operating assumption underlying this statement of mission was that the focus of the Task Force was limited to the Package Foods Operations Division. The objective of the Task Force was to determine how the Division could create the greatest sustainable value for General Mills, Inc.

Inherent in this process was the necessity of making assumptions about the likely needs of General Mills, Inc. Instead of attempting to predict these needs, the Task Force assumed that the Corporation would continue to be market driven and highly responsive to the marketplace.

Consequently, the Task Force assumed that the Package Foods Operations Division would make its greatest contribution to the success of General Mills, Inc., if the Division were similarly market driven. The Task Force reasoned, therefore, that the Division should look directly to the market to determine how best to achieve a sustainable competitive advantage as a manufacturing unit. By so doing, it then would be best serving the Corporation and adding the greatest value.

Methodology and Organization of Report

The Task Force engaged in extensive data collection in order to assess the future, and to determine what actions might give the Division a sustainable competitive advantage. The data collection included information from three primary sources: experts (internal and external) visits to other companies, and published documents. The meetings with experts and the visits to other companies were reduced to detailed written reports for the Task Force.

Substantial amounts of information were collected about each of the four areas mentioned in the mission statement of the Task Force. Specifically, experts addressed the Task Force on the subjects of human motivation, organization and human resources, industrial relations, manufacturing technology, computerization and information systems,

distribution, the food market and food industry, product development and food technology, and the strategic planning process.

All of the information that was collected is attached to this report in the Appendices. The material is organized according to the four areas of consideration described in the Mission Statement, and two general areas:

competitiveness, and case studies and company visits. Some of the material is relevant to more than one area of consideration; when the material has a clear dual purpose, it is duplicated in each of the relevant Appendices.

In order to understand the conclusions of the Task Force, the material must be treated as a whole. The methodology used by the Task Force to analyze the data was straightforward. The analysis first sought to identify basic trends in the environment in which the Package Foods Operations Division would have to operate in the future. Critical appraisal of these observed basic trends led to determining the implications of the trends. Recognizing the implications of the trends led to identifying specific strategies for creating a sustainable competitive advantage. These strategies are presented as specific guidelines and recommendations for the Division. For purposes of organization and presentation, the guidelines and recommendations are divided into nine categories:

1) scope/new products,
2) processes and technologies,
3) capacity,
4) facilities,
5) quality,
6) vendor relations,
7) vertical integration,
8) manufacturing infrastructure, and
9) human resources.

This division should not, however, cloud the fact that the guidelines and recommendations are interdependent. They are an integrated whole that logically flows from the implications drawn from the basic trends the Task Force identified in the environment.

ENVIRONMENT

1. DEMOGRAPHICS

A. The population and workforce* will grow more slowly than at any time since the 1930s.

TABLE I**
U.S. Population Growth is Slowing
(Average Annual Percent Population Gain)

1930s	1940s	1950s	1960s	1970s	1980s	1990s
0.71	1.45	1.85	1.34	1.14	1.00	0.73

TABLE II***
U.S. Workforce Will Grow More Slowly
(Average Annual Percent Gain — Workforce)

1930s	1940s	1950s	1960s	1970s	1980s	1990s
0.86	1.13	1.13	1.95	2.92	1.47	1.00

B. The population and workforce will generally age; the average age of the population and the workforce will rise, and the pool of young workers entering the labor market will shrink.

(1) By the year 2000, the median age will be 36.3; six years older than at any time in history.

TABLE III**
The U.S. Population is Growing Older
(Median Age)

1940	1950	1960	1970	1980	1990	2000
29.1	30.2	29.4	27.9	30.0	33.0	36.3

(2) The average age of the workforce will rise from 35 in 1984 to 39 in 2000.

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* The sum of all persons who are employed and all persons who are unemployed and actively seeking work.

** Source: U.S. Bureau of the Census.

*** Source: Bureau of Labor Statistics.

TABLE IV*
The Workforce Will Become More Middle-Aged
(Numbers in Millions)

	1980		2000	
	Number	Percent	Number	Percent
16-34	56,960	49.5	52,061	38.6
35-54	43,242	37.6	68,357	50.7
55+	14,748	12.8	14,532	10.8

(3) The number of people under 30 years of age will fall significantly, from 18 percent of the population to 13 percent.

(4) The population over 65 years of age will grow, but at a rate more slowly than the overall growth rate, with a total growth of about 10 percent.

C. The role of women in the workforce will grow.

(1) 45 percent of the workforce will be women.

(2) 60 percent of all women will work outside the home.

TABLE V*
Workforce Growth is Mostly Females

Total	1985 115.5 Million %	2000 135 Million % of Increase
Native White Males	47%	18%
Native White Females	36%	42%
Native Non-white Males	5%	8%
Native Non-white Females	5%	12%
Immigrant Males	4%	10%
Immigrant Females	3%	10%

(3) 63 percent of new entrants into the workforce will be women.

* Source: Bureau of Labor Statistics.

D. Minorities will contribute a larger share of new entrants into the workforce.

(1) 29 percent of the growth in the workforce will be minorities.

(2) 15.5 percent of the total workforce will be minorities.

TABLE VI *
Non-Whites Are a Growing Share of the Workforce

	1985	2000
Total Workforce (Millions)	115.5	135.0
Non-White Total	15.1	20.9
Non-White Share	13.1%	15.5%

E. The immigrant share of the increase in the workforce population will be greater than at anytime since World War I.

(1) The numbers are hard to estimate because of the uncertainty in the size of illegal immigration, the impact of the recent Immigration Reform and Control Act of 1986, and the impact of economic and political events overseas.

(2) Most of the immigrants will come from Latin America and Asia.

(3) Many of the immigrants will have significantly different value systems and tastes.

(4) A significant portion of the immigrants will be poorly educated.

* Source: Bureau of Labor Statistics.

F. The West coast, Arizona, Texas, and Florida will experience the greatest growth in population. Immigration will be the largest source of this growth.

G. The North Central and Northeast regions will have population declines or at best stable populations.

TABLE VII*
Projected "Top 16" State Rankings for Year 2000

STATE & RANK in YEAR 2000	RANK in 1986	POPULAT ION in 2000
1. California	1	30.6
2. Texas	3	20.7
3. Florida	6	17.4
4. New York	2	14.9
5. Pennsylvania	4	11.2
6. Illinois	5	11.2
7. Ohio	7	10.4
8. Michigan	8	9.2
9. New Jersey	9	7.4
10. North Carolina	10	6.9
11. Georgia	11	6.7
12. Virginia	13	6.4
13. Washington	19	5.8
14. Indiana	14	5.7
15. Arizona	27	5.6
16. Massachusetts	12	5.5

* Source: Washington Post, 9/3/86.

2. IMPLICATIONS FROM DEMOGRAPHIC CHANGES

A. The rate of economic growth will decline compared to the 1960s and 1970s because of the declining rate of growth in the population. Other factors can influence the rate of growth, but the population decline alone will result in a net reduction in the overall U.S. growth rate.

B. Because of lower growth rates and fewer young people, there will be less demand for population-sensitive products such as food, automobiles, housing units, household goods, and educational services for children.

C. Economic growth will depend on increasing demand for income-sensitive products and capturing a larger share of disposable income. The luxury market sectors, such as institutional meals, high value added goods, travel, and tourism, will grow more quickly.

D. Productivity gains will account for a greater percentage of growth in the Gross National Product.

E. The labor market will tighten because of a dearth of young adults and a smaller reservoir of well-qualified workers.

F. The workforce will become more rigid because it will be older with more two-earner families; people will be less likely to move, and more difficult to retrain. Companies will need to build cultures that are open to change and growth, and will need to adopt human resource policies that encourage flexibility and learning.

G. Unit labor costs will rise as pay scales, benefits, and pension costs rise with the aging population.

H. Competition for fewer positions on the corporate pyramid will become intense as more and more people compete for fewer high level jobs; traditional expectations for advancement will be frustrated.

I. People will have more disposable income as a percentage of total income because they will have fewer dependents, the start-up investments in beginning a family will have already been made, and more people will be nearing retirement.

J. The workforce will be more experienced, stable, reliable, and generally healthy.

K. The feminization of the workforce will increase pressure for flexible-time work, part-time work, and quality day-care.

L. Members of the workforce will have vastly different benefit needs.

M. The greater influx into the labor market of minorities and immigrants may require greater attention to basic educational skills.

N. More two wage-earner families and older families with higher percentages of disposable income will consume more high value added and prepared food at home and away from home.

0. Economic growth, labor supply and demand will be regionally imbalanced.

P. The older population will be more health and nutrition conscious.

Q. There will be an increased demand for health services.

3. FOOD INDUSTRY

A. The food industry will become global at all levels – producers, processors, distributors, customers, and markets.

B. Competition will be international, will grow dramatically, and will become intense; processed food will face competition from imports and foreign companies producing in the United States.

C. The industry will consolidate and vertically integrate.

D. The food industry will face new entrants from other companies seeking cash flow, stability, and attractive profit margins.

E. Biotechnological and molecular engineering advances will create entirely new products and competitors; the developers of these new products and processes will gain unique market positions because of patents and proprietary information.

F. Products and processes produced through biotechnology and molecular engineering will be expensive, and in controlled and limited supply.

G. Basic commodities will remain abundant; capacity and supply will exceed world demand; basic commodities will be relatively inexpensive.

H. More and more companies will enter into joint ventures for product and process development, marketing, and distribution. The joint ventures will concentrate on biotechnological and international areas.

4. IMPLICATIONS FROM INDUSTRY

A. Competition will be intense and will come from all directions, including many new and unexpected sources.

B. Companies need to capitalize on biotechnological and molecular engineering advancements in order to acquire proprietary and patented products insulated from the fiercely competitive market.

C. Companies need to focus on being premium quality and service added companies in order to differentiate themselves from their competitors and segment the market.

D. Companies need to strive constantly for higher quality, total customer satisfaction, and unique processes and products, because slowing down results in losing one's competitive edge.

E. Full participation in the international market gives the multi-national companies a competitive market advantage: greater growth potential; greater cross-cultural experience that spreads the risks of market change and tends to produce greater flexibility and responsiveness; greater resources; greater sources of ideas; and greater market power.

F. Companies will use joint ventures to spread risk and to gain resources, market access, expertise, and experience.

5. FOOD MARKET

A. Information technology in the grocery store and in wholesale distribution will lead to greater control over producers, through the use of, for example, direct product profitability analyses, space management systems, shelf replenishment systems, and gross profit reporting systems.

B. The market will see a proliferation of products (Stock Keeping Units) as companies try to differentiate themselves and segment the market.

C. The technological assessment capabilities of customers, the frequent introduction and proliferation of products, and limited shelf space will mean that many products will have short life cycles, and successful products will constantly be struggling to maintain their position.

D. The information technologies will allow for direct order connections between customers and producers, and for precise planning, instant response capability, and direct store delivery.

E. Consumers will want nutritional and healthful (medicinal) products, fresh goods, specialty products (gourmet, ethnic, demographically targeted) ready-to-eat and prepared products, and products in portion sizes.

F. Consumers and customers will expect very high quality and special services, even from near commodity producers.

G. Because of efficiencies, independent distributors will grow.

H. Direct store delivery will grow significantly for certain market segments.

I. Specialty food and service stores will proliferate.

J. Biotechnological and molecular engineering will produce totally new products and processing methods; most of the new products and processes will be either proprietary or protected by patents.

K. The largest growth in consumption will be in institutional sales, i.e., meals eaten away from home.

L. The market for home delivery of prepared meals will grow dramatically.

6. IMPLICATIONS FROM FOOD MARKET

A. Companies need to focus on continually improving quality and service, and differentiating with exceptional and special services and quality.

B. Companies need to be extremely flexible, responsive to changes in the market, and able to serve customer needs on short notice.

C. Companies should seek to develop proprietary and patented products and processes to insulate themselves from competition.

0. Companies should integrate closely with customers, sharing information technology systems, computer hook-up, joint planning, and assistance in developing and implementing management systems such as shelf-management, gross profit analysis, direct product profitability analysis, shelf-replenishment ordering, inventory management systems, and merchandising assistance.

E. Products are sold as part of a service; serving the customer becomes the object rather than selling a particular product; the business is a service. Production and delivery are part of an overall delivery service. The services add significant value to the product, and segment the market.

F. Flexible, responsive, high quality manufacturing is critical to ensuring the delivery of the special services that distinguish and differentiate products, responding to rapidly changing markets, and developing proprietary and patented products.

G. The time lapse from product conception to full marketing must be short.

H. Vertical integration of food processing and institutional sales, with special emphasis on institutional sales, provides an expanding market for food products; this requires great flexibility and high quality by the manufacturer to satisfy the different requirements of each customer.

INTRODUCTION TO GUIDELINES AND RECOMMENDATIONS

The purpose of the Task Force and of this Report is one of strategic planning rather than long-term planning. The focus is on defining what the Division needs to do in order to create a sustainable competitive advantage, rather than describing a plan for how to get there. The Report proposes a direction for the Package Foods Operations Division;

the guidelines and recommendations are intended to guide choices and decisions that determine the future nature and direction of the organization.

The driving force for the Division is its production capability. The Task Force sees the Division gaining a sustainable competitive advantage by differentiating itself. The Division will create an advantage for itself, and add value to General Mills, by becoming a highly flexible, highly responsive, cost efficient and premium quality manufacturer that embraces change. These qualities in the Division would give General Mills greater ability to meet market demands, and to differentiate itself and its products.

The Analysis

The guidelines and recommendations are divided into nine categories. The nine sections reflect separate decision categories and key capabilities for the organization, but are interdependent.

The guidelines, recommendations, and critical issues presented in each category must be read in light of the other categories. For example, the recommendations in the Capacity section are inseparable from the recommendations in the Processes and Technologies section. Similarly, the Quality recommendations are dependent on the Human Resources recommendations. In short, although separated for purposes of

exposition, the different categories are part of a unified system that needs to be viewed in its entirety. Specific details that on their own may seem unworkable, for instance, are feasible when accompanied by other changes in the system.

Technological Change

Technological change is a dominant theme in this Report, and is of critical importance in the competitive world beyond the year 2000. No one can predict what technological changes will occur in the next twenty years.

Twelve years ago, for example, personal computers did not exist. Man's knowledge is doubling in very short periods of time. All in all, we can only be certain that technology will change dramatically in the next twenty years, and will continue to change thereafter.

We can be quite certain that computer and information processing technology and applications will change, far exceeding our current capabilities. We can be reasonably certain that biotechnological developments will create new organic substances, and allow us to produce existing organic substances in totally new ways. We can also easily imagine that today's experiments in molecular engineering will move out of the laboratory and into the applied world.

The advances in molecular engineering may be the most dramatic of all technological advances. Molecular engineering involves the manipulation of single molecules, the building blocks of the universe, to create new substances. Currently, scientists are limited to manipulating complex chains of molecules, for example, DNA or proteins. Molecular engineering will free the scientist to create entirely new substances.

One example already in the laboratory involves taking individual carbon molecules and arranging them in crystalline form to create a sheet of pure, solid diamond. Eventually, one can expect the manufacture of sheets, wires, and coatings of pure diamond. This capability would revolutionize many industries, such as the machine-tool industry, and enable users of the diamond products to do things they never assumed possible. For example, a diamond-coated cutting edge could theoretically last indefinitely.

Regardless of what the specific discoveries and applications are in computer systems, biotechnology, and molecular engineering, the Task Force sees the rate of advancement accelerating substantially. Developments will occur that challenge many established practices in the Package Foods Operations Division, in General Mills, and in the food industry.

Many of these developments will create sustainable competitive advantages for user companies. The issue is not whether the food industry will be profoundly affected by technological change, but whether the Package Foods Operations Division takes advantage of these changes, or responds slowly, underutilizing new developments, and suffering a competitive disadvantage.

The Role of People

In the uncertain and ever-changing world of the future, people determine the success or failure of an organization. If the people in the organization lack the motivation or the skills to compete and to change, then the organization will not succeed. Conversely, organizations with employees who are committed to total customer satisfaction, competitiveness, and change will have an asset that gives the organization a competitive advantage. Employees who are dedicated to being the best and have the skills to be the best, give the organization a tremendous advantage as it deals with markets and competitors that are constantly changing and are extremely demanding.

Because of the importance of people in achieving a sustainable competitive advantage beyond the year 2000, the Task Force places special emphasis on the Human Resources section of the Report. This emphasis is further reinforced because the Task Force sees the people in the organization as being crucial to implementing the

recommendations outlined in the other sections. In short, the Human Resources of the Company are seen as being the critical variable in the transition from today's world to the world beyond the year 2000.

The Guidelines and Recommendations

The style of presentation of the guidelines and recommendations is descriptive; the text below describes what the Division would need to be like in order to achieve a sustainable competitive advantage beyond the year 2000. In other words, the following guidelines and recommendations describe what a competitive Package Foods Operations Division would look like, and how it would operate in the year 2005.

SCOPE AND NEW PRODUCTS

1. Diverse mix of manufacturing technology; "old" systems producing core products, and state of the art systems producing new products.

2. Frequent introduction of new products and food processes.

3. Rapid turnover of many new products, many failures, product life cycles are short.

4. The few long life cycle successful core products are constantly threatened by new challenges.

5. Increased demand for:
   a) freshness,
   b) high nutrition,
   c) healthful – medicinal products, e.g., anti-cancer, anti-heart disease,
   d) special market products, e.g., gourmet, ethnic and demographically targeted,
   e) high value added products,
   f) prepared/ready-to-eat/convenient products,
   g) portion sizes,
   h) variety,
   i) institutional/away from home meals,
   j) home delivery meals.

6. Biotechnological, molecular engineered new products (not now in existence), new ingredients, and new production processes. New ingredients and new production processes for existing products also lead to new products out of existing products.

7. Unique products, processes, and ingredients with high economic value, protected by patents and proprietary, resulting from biotechnology and molecular engineering.

8. Higher percentage of proprietary products and processes.

9. Products that are differentiated but in the same family because of common production processes, with the differentiation being add-ons and packaging at the end: e.g., cake mixes and prepared cakes.

10. Greater integration of products and processes around a core of products in a setting of major breakthroughs.

11. Highly segmented product mix.

12. Greater competition for limited shelf space from an expanding variety of products controlled by product profitability analyses.

13. Computer driven systems in stores tied to scanners producing product profitability analyses and controlling product mix.

14. Stores that stock only successful products and introductory products.

15. The market is subject to major breakthroughs due to advances in biotechnology and molecular engineering; the market can shift directions quickly.

16. Short time span from product development to market shelf.

17. Quick response to new food process technologies, raw material developments, and product advances.

18. Manufacturing technology has a shorter life cycle, years rather than decades.

19. New manufacturing processes, rooted in molecular engineering and biotechnological advances that are totally unlike existing systems, e.g. enzyme processing.

20. Food R&D is of greater importance (shorter cycles, greater proliferation, greater competition).

21. Participation in biotechnological and molecular engineering research and development, joint ventures, and equipment and technology R&D is critical.

22. Quicker responsiveness to the market and reduced development-to-market time require greater integration of marketing, R&D, and manufacturing.

23. In-house manufacturing is of greater importance because of its responsiveness, flexibility, efficiency, and the proprietary nature of products and processes.

24. In-house manufacturing is frequently used for on line product development.

PROCESSES AND TECHNOLOGIES

1. Plants include a diverse mix of manufacturing technology; "old" systems producing long life cycle core products, and state-of-the-art and highly flexible systems producing new products. Operations include a range of batch, continuous, closed, and new processes, tailored to products and market demands, and appropriate to needs. Old systems have add-ons, including computer integration, robotics, etc., to up-grade and retrofit in order to improve quality efficiencies and flexibility.

2. Highly flexible production lines that produce for demand can be quickly reconfigured to make other products.

3. Equipment efficiently handles short production runs so as to meet daily needs and surges from seasonal and promotional market demands without increasing inventory levels.

4. Equipment change-overs occur with little down time; down time measured in minutes rather than hours.

5. Ultra-high speed equipment.

6. A fully integrated hierarchy of computer-controlled processes that allow direct order input coordinates continuous production, monitoring and checking all aspects of the process, including packaging and final palletizing for specific order shipment.

7. Information, control, and computer technology systems are open; employees have access to, and can control the equipment and systems.

8. Customers, including wholesale distributors and chain stores, and raw material vendors are connected into the computerized scheduling network enabling individual direct order production and delivery.

9. Production on demand with delivery directly to stores and independent wholesale distributors.

10. Just-in-time planning and raw material and finished product inventory systems with flexible, low inventory levels are centered around a delivery on demand scheduling of production.

11. Extensive use of sophisticated sensors such as biosensors, thermal probes, spectroscopes, vision systems and infrared, and artificial intelligence expert systems are part of on-line adaptive control systems that continuously adjust the process to maximize system and line efficiencies and consistency in quality.

12. Self-monitoring equipment for maintenance purposes and programmed preventative maintenance.

13. New manufacturing processes rooted in molecular engineering and biotechnological advances that are totally unlike existing systems, e.g., enzyme processing.

14. Closed system production processes, like chemical plants.

15. Equipment and processes are designed jointly by engineering, product development, marketing, operators, and production management using socio-technical systems methods of design.

16. Equipment and control systems are designed to fit with a self-managing work team and flat hierarchy organization, and are consistent with the objective of providing total customer service.

17. Advanced package materials, the result of molecular engineering, package the product on ultra-high speed lines into optimized containers.

13. Under the computer integrated manufacturing system, packaging lines produce different sizes and shapes of packaged products without down-time for line change-overs to fill specific direct orders.

19. As part of the computer integrated system, programmable robots are extensively used, for example, in tasks such as coupon dropping, quality control auditing, packaging and palletizing of variable orders, and line reconfiguration and change-overs.

20. Short product cycle times – raw material through packaging – of less than one hour.

21. Centralized control rooms in addition to on-line computers and control systems.

22. Quality, continuous information about real time performance, product flow, and equipment performance is easily and immediately accessible through computers positioned throughout facilities.

23. Warehousing capacity is entirely automated and computer integrated with the production system.

24. Production technology and processes change often; life-cycles are measured in years rather than decades.

CAPACITY

1. Produce for demand for high percentage of market with promised delivery within set time period; delivery radius of approximately one day drive.

2. Small percentage made for inventory, some cushion in semi-processed and bulk storage to be processed and packaged for demand.

3. Manufacture for a committed service level, a high standard of customer service, for example, order delivered within 72 hours from time of receipt.

4. Systems designed for a flexible capacity range with little change in staffing. Normally operate equipment at well below maximum capacity.

5. Maximize up time at less than full capacity.

6. Excess equipment capacity, totally productive work force, limited inventory of raw materials and of finished products, with surge capacity for the introduction of new products and promotions.

7. Surge inventory capacity for new products and promotions.

8. Down cycles used for intensive training and maintenance.

9. Close integration with suppliers and customers using rigorous joint planning systems; direct customer and supplier computer linkage.

10. Decisions regarding the use of temporary and part-time workers and outside contractors will be made by the participative process described within this Report, and consistent with the make/buy criteria described within this Report:
    a) cost effectiveness,
    b) impact on workforce stability and security, and
    c) consistency with business purpose.

FACILITIES

1. Free standing facilities or factory within a factory.

2. Large plants restructured into factories within a factory; distinct, independent operating units under one roof.

3. Operating units have an upward limit of about 200 employees.

4. A large number of small plants geographically dispersed; decentralized around the country, regionally based.

5. Close to market, one day drive; centrally located to highway system in order to provide one-day-drive service.

6. Increased numbers of facilities in South and Southwest, stable or decreasing number in North, North Central, Northeast.

7. Plant capacity easily expandable with marginal changes: add-ons to the existing systems, variable control through-puts, etc.

8. Flexible physical plant so that technology and process can be easily changed and reconfigured; for example, erector set, plug-in, or mobile systems.

9. Dedicated plants for related families of products; different product families with same technology base; focused factories.

10. Large open space layout with smooth, direct product and supply flows. Few walls. Straight line production process; in one end out the other.

11. Limited supply and finished goods warehouse capacity, and in process storage capacity; totally automated storage and warehouse systems.

12. Services and supplies are adjacent to production process.

13. Centralized control systems.

14. Meeting room space adjoining shop floor.

15. Open offices with minimal status distinctions.

16. Direct support staff and management "office space" adjacent to production process.

17. Aesthetically pleasing, environmentally sensitive, and clean.

18. High energy efficiency and use of cogeneration where possible.

19. Atmospheric controlled.

20. Strong community identity; strong community citizenship.

QUALITY

1. Total quality system.

2. Ethic of quality.

3. Standard of performance: zero defects, no rejects, and no waste is the objective.

4. Continually higher requirements for product quality and customer service.

5. System built around statistical quality control.

6. Every employee practices statistical quality control.

7. Every employee accountable for his or her own quality and his or her own inspection; engineer quality and build quality rather than inspect quality.

8. Quality is defined broadly to include service as well as product.

9. Suppliers are quality certified so that incoming inspection requirements are reduced.

10. System of total customer satisfaction; customers (internal and external) of a product and a service are identified, and employees are responsible for satisfying the needs and requirements of the customer.

VENDOR RELATIONS

1. Just-in-time (JIT) delivery of raw materials.

2. Vendors are quality certified; certification includes factors such as labor relations and the full integration of statistical quality control in production systems.

3. Cooperative relationship, joint problem solving.

4. Long-term, stable relationships with a limited number of suppliers.

5. Proximately located or other system to allow for JIT.

6. Computer linked for direct order of product.

7. Joint planning and forecasting.*

8. Full sharing of GMI customer information for joint planning.*

9. Joint development of ingredients, processes, and packaging.*

10. Proprietary relationship for high value, biotechnological, specialty products.

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* This may require a formal, legal relationship in order to protect proprietary information.

VERTICAL INTEGRATION

1. Make/Buy decisions are based on:
   a) cost effectiveness,
   b) impact on work force stability and security, and
   c) consistency with business purpose.

2. Integrate, including forming partnerships and joint ventures, into biotechnological and molecular engineering concerns that develop new raw materials and new production processes in order to indirectly control raw material sources and new production technologies.

3. Focus on processing packaged food; integrate to add services and produce specialty products.

4. Manufacture basic and proprietary products for GMI-owned restaurants and home delivery.

5. Joint ventures in distribution and new markets, for example, international markets and direct product delivery.

MANUFACTURING INFRASTRUCTURE

1. Management is responsible for:

   A. bringing special technical skills and knowledge to the decision-making process in running a facility;

   B. making decisions delegated by the corporation;

   C. coordinating and assisting the organization in problem solving, dealing with interpersonal problems, discipline, and the world outside the facility;

   D. ensuring the full and timely communication of information;

E. ensuring the setting of goals, objectives, and operations consistent with corporate goals, objectives, and policies;

F. ensuring that the teams have sufficient quality professional resources to meet their performance objectives; and

G. developing and ensuring the integrity of the organizational culture, its human resources, and the high involvement organizational structure.

2. Semi-autonomous, self-managing work teams are responsible for the management of their own work areas and accountable for producing a quality product for a customer, internal or external.

   A. Teams are responsible for coordinating and planning with professional resources the training of their members.

   B. Teams work closely with professional resources to select their own replacements.

3. Representatives of a cross section of employees, managers, and teams form standing committees that are responsible for coordinating, communicating, solving problems, and making decisions regarding the plant-wide issues of:

   A. scheduling;
   B. planning;
   C. budget setting;
   D. goal setting;
   E. organizational and culture maintenance; and
   F. policy and rule making.

4. Office administration personnel are organized as a semi-autonomous, self-managing team similar to the operations teams.

5. Operating rules, policies, and procedures are developed consistent with corporate direction and with the involvement of the people who must implement the rules, policies, and procedures; they are constantly updated and described in detail in a system of manuals and a parallel computerized system. The standing committee on policy and rule making oversees this process in order to ensure consistency.

6. The organization has an open, fair, participatory, cooperative, egalitarian culture that is oriented toward providing total customer satisfaction through total quality

and total service, striving for better quality and service, and seeking higher levels of performance while fostering the development of its people.

7. The plant organizational structure, consisting of three or four levels, is supported by a professional staff of personnel, engineering, accounting, and other disciplines who are responsible for servicing the operations teams; their responsibilities are to help the teams achieve the team and organizational goals, and to help the organization in its planning, budgeting, goal setting, organizational and cultural maintenance, and the like.

8. Professional staff and management are organized to work as a team.

9. Production scheduling, and inventory and materials management is market driven through direct customer orders by means of central computer integration.

10. Management, with the assistance of professional staff, is responsible for ensuring the timely, full communication of information concerning the business, the market, and performance to all employees.

11. Decision making occurs through a participatory process in which all of the stakeholders in a decision are involved in the process directly or through their representatives. Some decisions may be delegated to an individual by the group, or assigned to an individual due to corporate accountability or policy, or due to an emergency.

12. Performance is continually evaluated against the performance of other organizations through a process of environmental scanning and comparative benchmarking, the objective being that PFOD is the best at whatever it does.

HUMAN RESOURCES, CULTURE and ORGANIZATION

1. The culture and policies of the organization are built around certain premises:

   A. People are the company's most enduring and valuable asset and are even more important in times of great change.

   B. People make their greatest contribution when they know what to do, how to do it, and are motivated to do it.

C. All employees are committed to total customer satisfaction through total quality and total service.

D. All employees participate, and have a vested stake in the business.

E. All employees are committed to the success of PFOD, and PFOD is committed to the satisfaction of the needs of each employee.

2. In PFOD operations organized by the American Federation of Grain Millers, the Company and the Union are partners in the business; the success of one needs the cooperation and assistance of the other, and leads to the success of both.

As partners, the Company and Union:

A. have a relationship based on trust;

B. accept and respect each other;

C. accept their differences as well as their agreements;

D. help each other succeed and achieve their goals;

E. are totally open and share information;

F. share in the risks of the marketplace and the rewards of success;

G. solve problems rather than fight; and

H. work together cooperatively to provide total customer satisfaction through total quality and total service.

3. PFOD and its employees are partners in the business:

A. Employees are committed to making PFOD successful by achieving total customer satisfaction through total quality and total service.

B. PFOD is committed to providing lifetime employment security, a healthy, safe work environment, an opportunity for each individual to satisfy his or her needs, and an opportunity for each person to grow and develop as individuals.

C. Employees are committed to continual learning, contributing their ideas, trying to solve problems, sharing information, working up to their potential, giving a fair day's labor and helping others.

D. PFOD is committed to continual training, involving all employees in running the business, completely sharing information, and treating employees fairly and equitably.

E. PFOD will provide a division-wide system of employment security so that after an initial period of employment, an employee will be assured of employment with PFOD for life as long as he performs satisfactorily and learns the new skills and knowledge that is required, except in cases of natural disasters and market dislocations.

F. Decisions regarding the use of temporary and part-time workers and outside contractors will be made by the participative process described within this Report, and consistent with the make/buy criteria described within this Report:
   a) cost effectiveness,
   b) impact on workforce stability and security, and
   c) consistency with business purpose.

G. All employees will be provided with career development counseling, and be thoroughly appraised at least once a year with a detailed evaluation of their performance on the job, problem solving, mastery of new skills, and interpersonal relations and skills.

4. The organization and people at PFOD must be extremely flexible, restrained only by the objective of providing total customer satisfaction. All people must be treated fairly and with respect, and must be well trained to do any task they need to do so as to be effective and not a danger to themselves, to others, or to the organization.

5. The people and the organization must embrace change.

6. New employees are carefully screened to ensure that they fit into the partnership organization; are committed to continual learning, problem solving, cooperation, flexibility, and the goals of PFOD; have the aptitude to learn statistical quality control, computer usage, and basic mechanical skills; and have good interpersonal skills.

A. Division-wide systems and standards for hiring are used.

B. The employees who will work with particular new employees are primarily responsible for hiring those new employees, with the assistance of professional staff.

C. Applicants go through several batteries of interviews.

D. Applicants are given pre-hire orientations about PFOD, the prospective work, and the values of the organization.

E. Applicants go through assessment center analyses to determine fit with the PFOD organization.

F. Applicants are subject to general aptitude tests relating to mechanical ability, basic literacy, computer usage, and statistical analysis.

G. Because of tightness in the labor market, PFOD needs to be ready to hire aptitude rather than ability, then train within PFOD.

H. Because PFOD may draw heavily from immigrant populations, an intensive system of training may be needed to provide rudimentary skills for these new employees.

7. After extensive counselling and developmental work, a comprehensive outplacement program and generous system of support is used for existing employees who do not fit within the new PFOD organization because of an inability to change, a lack of aptitude, or dislike of the new PFOD organization.

8. The overall number of employees will not grow and will probably fall significantly unless PFOD experiences substantial growth; the number of managers, supervisors, support staff, and production employees will all be significantly reduced.

9. Most job placement will be from within PFOD, except for special needs, special skills, or new facilities that could not be filled internally.

10. Training:

A. All employees are thoroughly trained to high levels of competency in:

(1) General education
    (a) reading
    (b) writing
    (c) mathematics,

(2) step-by-step problem solving,
(3) effective communications and presentation,
(4) interpersonal interaction,
(5) general business economics and management,
(6) quality control, statistical analysis, and statistical quality control,
(7) basic computer operation, and
(8) basic mechanical skills and equipment knowledge.

B. Training in PFOD is institutionalized at different levels including:

(1) entry level and basic skills,
(2) on the job and technical skills,
(3) advanced skills, and
(4) career development.

C. Training is supplied through a coordinated use of:

(1) internal training systems and personnel, both professional and part-time,
(2) external independent contractors, and
(3) external institutions such as vocational schools, and universities.

D. Training of all employees is on-going and never-ending; knowledge, understanding, and skills are continually being lifted to higher levels and broadened.

E. Annual training costs should be in the range of $2,000 to $3,000 per employee in 1986 dollars.

F. Each employee should be counseled and a flexible, long-term training program should be developed to maximize the benefit to both PFOD and personal and career development.

G. The training program and counseling are part of an integrated division-wide system of manpower planning and intra-division manpower placement covering all employees.

11. Production facilities operate as high involvement or high commitment organizations as characterized by the following:

    A. The organization is designed to create high commitment, to use high commitment, and relies on receiving high commitment from all of its members.

    B. There is a flat organizational structure; the plant has three or four levels in the hierarchy, general manager, operations management, and operations personnel.

    C. People are organized into self-managing teams of workers who are responsible and accountable for producing a quality product for a customer, internal or external.

        (1) Teams are assisted by resource advisors who help the team in coordination, communication, dealing with the world outside the team, interpersonal problems, discipline (but do not administer it) technical problems, record keeping, meeting management, and problem solving; the resource advisor is not a supervisor.

        (2) Team members are responsible for the total satisfaction of the customers of the team's product through total quality and total service.

        (3) Team members do not have single job classifications, rather they are responsible for learning multiple skills and multiple jobs so they can serve their team in different ways at different times, each according to personal desires, personal growth and development, and team and company needs.

        (4) Maintenance skill areas are provided by teams.

        (5) The team is responsible for coordinating and planning, with professional resources, the training of its members so that each member is operationally competent to provide total customer service for a full range of tasks within the team, and each member has the basic skills expected of all PFOD employees.

        (6) The team is responsible for its internal scheduling and the day-to-day management of its area.

(7) The team is actively involved in selecting its own replacements.

(8) Representatives from different teams, through task forces or committees, are involved in solving broader problems, coordinating and managing the entire operation, setting organizational goals, and ensuring total customer satisfaction.

D. The organization is staffed with totally productive people; people flexible enough to take on temporarily expanded responsibility to fill needs. People are responsible not for a job, but for the total satisfaction of their customers, so they do what they need to do to achieve the desired result.

E. The organization is adequately staffed to allow for continual training, information sharing, and structured problem solving.

F. Manager to worker ratios are in the 1 to 30-50 range.

G. Operations personnel are divided into few levels: for example, entry, operations, skilled maintenance, and technical specialists. Within each level are numerous skill areas and tasks. Individuals over time must master several skill areas and tasks within his or her level. Over a period of time, individuals progress across levels. Within levels, individuals move freely between tasks and skills that they have mastered, continually learning new tasks and skills and refreshing old skills. People are paid according to level and mastery of skills.

H. People are paid for their knowledge; as they master skills or sets of skills, their base salary rises, with no cap on the number of employees who can progress to the most highly skilled levels.

(1) Progression depends on rigorous testing of knowledge and demonstrated competency.

(2) The employees are involved in developing the system, administering the system, and ensuring that skills and competency are retained and operational.

(3) Audits are built into the system to ensure that it works.

(4) Minimum levels of skill acquisition and timetables for achieving those skills are required of all employees.

I. Above this base salary, a significant percentage of compensation for employees is based on a combination of performance and profitability at the team, facility and division levels.

J. Status distinctions between management and workers do not exist; they are partners in the business, for example:

(1) everyone wears similar clothes,
(2) everyone is salaried,
(3) everyone abides by the same rules, and
(4) no one receives special privileges like reserved parking spaces.

K. The role of management is:

(1) to bring special technical skills and knowledge to the decision making process in running a facility,

(2) to be accountable for decisions delegated by the corporation,

(3) to manage discipline,

(4) to coordinate and assist the organization in problem solving, dealing with interpersonal problems, and dealing with the world outside the facility,

(5) to ensure the full communication of information,

(6) to ensure the setting of goals, objectives, and operations consistent with corporate goals, objectives, and policies, and

(7) to develop and ensure the integrity of the organization's human resources and high involvement organizational structure.

L. Employees at all levels of the organization are involved in relevant aspects of managing the business including:

(1) capital expenditures,
(2) technology development and acquisition,
(3) goal setting,
(4) budget setting,
(5) policy development,

(6) hiring and promotions,
(7) scheduling,
(8) dealing with customers,
(9) quality and cost management, and
(10) manpower planning and training.

M. Every person is accountable for his or her area of responsibility. People use a participative process to make decisions, but are accountable for final decisions in matters over which they have been delegated authority.

N. Decision making occurs through a participative process in which all the stakeholders in a decision are involved in the process directly or through their representatives. Some decisions may be delegated to an individual by the group, or assigned to an individual due to corporate accountability or policy, or due to an emergency.

12. Communication and Information: The open flow of information is central to achieving the commitment and understanding in employees necessary to create a high performing system; the system is no better than its information processing.

A. Except for legally sensitive information, personnel matters, and critical strategic and development planning information, all information in the organization is available to all employees.

B. Depending on its nature, important and operating performance information is shared in an organized manner on a daily, weekly, monthly, quarterly, or annual basis.

C. Everyone in the organization is trained to understand and evaluate different types of business, operating, and technical information.

D. Information is presented in organized and readily understandable forms.

E. Everyone has structured opportunities to question and discuss the information.

F. Everyone has structured, as well as informal, opportunities to share information and identify problems.

G. Information sharing is used as the basis for problem solving.

H. At computer terminals located throughout facilities, employees may retrieve real time and historical data, and may engage in analyses of the data for purposes of problem solving and information.

I. Management is responsible for ensuring that information is being shared and that everyone is trained to understand the information, to use it for problem solving, and to use the computer terminals for information retrieval and analysis.

13. Systematic, long-term planning is continually used throughout the organization and involves all stakeholders directly or through their representatives.

A. Everyone is trained in the basic skills of planning.

B. The focus of planning is to ensure that the organization has the skills and resources available to deal with an uncertain future and rapid change.

C. Human resource planning and development, including career development, high quality and accurate performance appraisal, and extensive training, are critical.

D. Short-term goal setting and problem solving are consistent with the long-term plans.

E. The entire organization receives extensive exposure to, and frequently uses outside resources, including customers, experts, and other companies.

F. Organizations and individuals constantly audit to see if they are on track with the long term plan and objectives.

G. Long term plans are constantly being reassessed to determine if they reflect the changing world.

14. Responsibility for making a decision is placed at the level that is directly affected by the decision, must implement the decision, and which, if the people are well-trained, know most about what needs to be decided.

15. Centralization occurs to the extent that clear economic and total customer service benefits exceed the costs and loss of flexibility. The presumption is to give control to those who have to make it happen and who know it best. Uniformity is preferred only if it leads to better total customer service.

16. For the purpose of creating a more successful organization, different teams, departments, and facilities engage in extensive cross-communications, joint problem solving, coordination, mutual learning, and appraisal.

17. The collective bargaining agreement is reduced to a skeletal agreement.

18. Codes of conduct and work rules within facilities are kept separate from the contract and are flexible and dynamic.

19. The collective bargaining process is conducted as a problem solving exercise in which the union and management seek to solve mutual problems after the full disclosure of information and joint assessment of the environment, the market, and operational performance.

20. Much of the contract acts as a document of fundamental belief and normally remains unchanged, like the United States Constitution.

21. Most of the economic elements of the contract are defined as processes and systems that ensure a fair return to the employees; consequently, the economic terms do not need to be renegotiated every term, but rather need to be debugged and re-appraised to ensure that they are working well.

22. Employee benefits are provided in a flexible cafeteria manner to allow employees in different situations to satisfy their own needs.

23. Although the collective bargaining agreement may have a term, the appraisal, auditing, and environmental scanning is continual. The contract provides that if problems arise, it may be renegotiated at any time. Many terms, such as the recognition, values, principles, objectives, and basic rights provisions, run without term and are rarely changed.

CONCLUSION: WHERE TO NEXT?

The Report of the Manufacturing Year 2000 Task Force is intended as a starting point for the Package Foods Operations Division of General Mills, Inc., and the American Federation of Grain Millers. It provides a basis from which to consider the

future, and begin to change in order to ensure the competitive success of the Company and its people. Failure to anticipate the future, and to transform the organization into a highly flexible, highly responsive, cost efficient and premium quality manufacturer that embraces change, will lead the Company down the path of the American steel and machine-tool industries.

The Report is intended to begin debate, within the Company and the Union, and between the Company and Union, about the future and the actions needed to ensure competitive success. The Task Force expects that people will not agree with the Report in its entirety, and that further study is needed concerning many of the issues raised in the Report. Follow-up to the Report should include extensive study regarding these issues.

The Task Force strongly believes, however, that because the future is impossible to predict, the debate and study should not focus on whether the trends, implications, guidelines and recommendations will occur within the next twenty years, but instead should concentrate on the following two issues:

1) If the conclusions of the report are true, what does PFOD need to do to be competitive?

2) If PFOD does change according to the guidelines and recommendations, will it achieve a sustainable competitive advantage that will give it competitive success fifteen to twenty years from now?

The Task Force believes that focusing on these two issues would give the Division a competitive advantage by allowing it to take control over its future, rather than merely reacting to events and competitors.

The critical follow-up to this Report is action. The Task Force is unequivocally convinced that extending the policies and practices of today into the future could lead to failure for PFOD. The Division and the Union need to begin the change process now to create a new, highly competitive organization in the future.

To begin the detailed examination and change process, the Task Force suggests setting up multi-discipline, vertical cross-section task forces dedicated to different parts of the Report. These task forces should report to a similarly constituted task force responsible for overseeing the development of the Manufacturing Organization of the Future. All of the important stakeholders should be involved or have significant input into this change process.

Finally, the Package Foods Operations Division needs to begin an extensive communications and education process for all of its employees in order to create an understanding of the need for change, and an awareness of the type of changes that must be made if the Division is going to survive and thrive in the future. Because of the magnitude of the necessary changes, and the long time frame needed to transform a

traditional organization into a highly flexible, highly responsive, cost efficient, and premium quality manufacturer that embraces change (the typical estimates given to the Task Force were eight to ten years) , the educational process cannot begin too soon.

The Report of the Manufacturing Year 2000 Task Force submitted January 15, 1987:

_____	_____
Harry Gandre, Co-Chairman	Tom Frain, Co-Chairman
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APPENDIX A: COMPETITIVENESS

	TITLE	AUTHOR(S) & PUBLICATIONS
1.	Strategic Planning: Professor Arnoldo Hax	Restructuring Associates Inc., July, 1986
2.	A Summary of: In Search of Excellence: Lessons from America's Best-Run Companies	Thomas Peters and Robert Waterman, Jr., Restructuring Associates Inc., 1986
3.	A Summary of: Industrial Renaissance: Producing a Competitive Future For America	William Abernathy, Kim Clark & A. Kantrow, Restructuring Associates Inc., 1986
4.	A Summary of: Megatrends – Ten New Directions Transforming Our Lives	John Naisbett Restructuring Associates Inc., 1986
5.	A Summary of: Japanese Manufacturing Techniques: Nine Hidden Lessons in Simplicity	Richard Schonberger Restructuring Associates Inc., 1986
6.	A Summary of: The Change Masters – Innovation for Productivity in the American Corporation	Rosabeth Moss Kanter Restructuring Associates Inc., 1986
7.	America vs. Japan, Can U.S. Workers Compete?	Richard Alm, U.S. News & World Report, 9/2/85
8.	Strategic Planning – Forward in Reverse?	Robert H. Hayes Harvard Business Review November - December, 1985
9.	The Corporate Strategic Planning Process	Arnoldo C. Hax Nicolas S. Majluf Interfaces, January-February, 1984

	TITLE	AUTHOR(S) & PUBLICATION
10.	An Unexpected Flop	Richard Corrigan National Journal, 4/12/86
11.	Why Some Factories Are More Productive Than Others	Robert H. Hayes Kim B. Clark Harvard Business Review September - October, 1986
12.	The High Price of Tradition	Perry Pascarella Industry Week, 8/18/86
13.	"Saturnization" of Chrysler?	Bureau of National Affairs, Inc., 8/28/86
14.	The Discipline of Innovation	Peter F. Drucker Harvard Business Review May-June, 1985
15.	Managing Innovation: Controlled Chaos	James Brian Quinn Harvard Business Review May-June, 1985
16.	Managing our Way to Economic Decline	Robert H. Hayes William J. Abernathy Harvard Business Review July-August, 1980
17.	Capital Markets and Competitive Decline	Richard R. Ellsworth Harvard Business Review September-October, 1985
18.	Behind the Hype at GM's Saturn	Anne B. Fisher, Fortune, 11/11/85

APPENDIX B: CASE STUDIES AND COMPANY VISITS

	TITLE	AUTHOR(S) & PUBLICATION
1.	Worker Participation at Xerox	Restructuring Associates Inc., June, 1986
2.	Xerox Cuts Costs Without Layoff Through Union-Management Collaboration	Peter Lazes T. Costanza Labor Management Cooperation Brief, U.S. Department of Labor, July, 1984
3.	J & L Specialty Steel Detroit, Michigan	Restructuring Associates Inc., July, 1986
4.	Westinghouse Furniture Systems Grand Rapids, Michigan	Restructuring Associates Inc., July, 1986
5.	The New American Factory – II Sherwin-Williams Plant	Ross L. Silberstein Sherwin-Williams, 3/14/84
6.	The Sherwin Williams Co. Richmond Workers Craft "New American Factory" With Mixed Bag of Tools	American Productivity Center October, 1984
7.	Plant Visit Summary, Sherwin Williams Co., Richmond, KY.	Harry Gandre, July 7 & 8, 1986
8.	L-S Electrogalvanizing (LSE) Co. Cleveland, Ohio	Restructuring Associates Inc., September, 1986
9.	Manufacturing Techniques at Allen-Bradley, Milwaukee, Wisconsin	Restructuring Associates Inc., September, 1986
10.	Choosing a Systems Design & the Principles Underlying the Design: The Shell Sarnia Chemical Plant	Thomas J. Schneider Restructuring Associates Inc., 1985

	TITLE	AUTHOR(S) & PUBLICATION
11.	A Sociotechnical Work-Design System at Digital Enfield: Utilizing Untapped Resources	Barcy H. Proctor National Productivity Review Summer, 1986
12.	Using Principles for Profit: Proctor & Gamble	Faith Ralston

APPENDIX C: HUMAN RESOURCES, CULTURE AND ORGANIZATION

	TITLE	AUTHOR(S) & PUBLICATION
1.	New Theories of Human Motivation and Their Impact on Future Organizational Design and Leadership: Dr. Michael Maccoby	Restructuring Associates Inc., March, 1986
2.	New Models and Trends in Labor-Management Relations: Professor Thomas A. Kochan	Restructuring Associates Inc., May, 1986
3.	High Involvement Management and Nontraditional Compensation Systems: Professor E. Lawler	Restructuring Associates Inc., May, 1986
4.	America's Labor Laws Weren't Written for a Global Economy	John Hoerr, Business Week, 1/13/86
5.	Management and Leadership	Dr. Michael Maccoby MITRE Corporation, McLean, VA 4/8/80
6.	Memorandum of Agreement Between Saturn Corp. & UAW	Contract, June 28, 1985
7.	Quality Circles After the Fad	E. E. Lawler III, S. A. Mohrman Harvard Business Review January-February, 1985
8.	New United Motors Manufacturing, Inc. and United Auto Workers	Contract, 7/1/85
9.	Balancing Human Values and Competitive Needs	Professor Thomas A. Kochan U.S. Department of Labor and George Washington University 3/5/86

	TITLE	AUTHOR(S) & PUBLICATION
10.	Employment Security as a Meeting Ground for the Integration of Competitiveness and Human Values	Robert McKersie U.S. Department of Labor and George Washington University 3/5/86
11.	How Can Worker and Union Commitment be Encouraged to Contribute to Industrial Competitiveness?	Richard E. Walton U.S. Department of Labor and George Washington University 3/5/86
12.	The Changing Situation of Workers and Their Unions	AFL-CIO Committee on the Evolution of Work, February, 1985
13.	The New Plant Revolution	Edward E. Lawler III Organizational Dynamics, Winter, 1978
14.	Methodology for the Development of a Human Resource Strategy	Arnoldo C. Hax Sloan School of Management, M.I.T., March, 1985
15.	Manufacturing Strategy: A Methodology and Illustration	Charles H. Fine/Arnoldo C. Hax Interfaces, November-December, 1985
16.	Employee Involvement and Gainsharing Produce Dramatic Results at Eggers Industries	Michael Dulworth Labor Management Cooperation Brief, U.S. Department of Labor, March, 1985
17.	Statements on Collective Bargaining During the Next 50 years	The Bureau of National Affairs, Inc., 7/12/85

	TITLE	AUTHOR(S) & PUBLICATION
18.	Impact of Employee Participation in the Development of Pay Incentive Plans: A Field Experiment	Edward E. Lawler III & J. Richard Hackman, May, 1981
19.	Special Report – The Case for Adversarial Unions	Barbara Reisman and Lance Compa Harvard Business Review May-June, 1985
20.	Meet Today's Young	Michael Brody, Fortune, 11/11/85
21.	The Payoffs of Paying for Knowledge	G. Douglas Jenkins, Jr. and Nina Gupta Labor Management Cooperation Brief, U.S. Department of Labor, August, 1985
22.	From Control to Commitment in the Workplace	Richard E. Walton Harvard Business Review March-April, 1985
23.	Statements Before Joint Economic Subcommittee on Impact of Demographic Changes on Labor Market	The Bureau of National Affairs, Inc., 7/30/86
24.	Thinking Ahead: New Labor – Management Models From Detroit	Daniel D. Luria Harvard Business Review September-October, 1986
25.	CWQC Programs: Are Quality Circles the Best Vehicles?	Ron Mitchell Larry Pace ASQC Conference, Anaheim, CA May, 1986
26.	Management Discovers the Human Side of Automation	John Hoerr, et al. Business Week, 9/29/86

	TITLE	AUTHOR(S) & PUBLICATION
27.	Technology Can't Solve Factory Woes Without a Change in Attitudes	Robert Haavind, High Technology, October, 1986
28.	Needed – New Kinds of Workers for CIM	Roger Draper, Managing Automation, August, 1986
29.	A Woman's Place Is At GE, Federal Express, P & G …	Irene Pave, Business Week, 6/23/86
30.	Unions Divided: The Revolt of the Rank and File	Jonathan Tasini, Business Week, 8/11/86
31.	The Plant of Tomorrow is in Texas Today	Gregory Miles, Business Week, 7/28/86
A.	Letting Workers Help Handle Workers' Gripes	Johnathan Tasini, Business Week, 9/15/86
B.	"Saturnization" of Chrysler?	Bureau of National Affairs, Inc., 8/28/86
C.	Spreading the Entrepreneurial Spirit: Two Steps Forward, One Step Back	Judith H. Dobrzynski, Business Week, 9/1/86
D.	More Executives Finding Changes in Traditional Corporate Ladder	Carol Hymowitz, Wall Street Journal, 11/14/86
E.	... As Firms Try to Refocus Workers' Career Prospects	Larry Reibstein, Wall Street Journal, 11/14/86

	TITLE	AUTHOR(S) & PUBLICATION
F.	The Implementation of Excellence: STS Management	James C. Taylor/Robert A. Asadorian Industrial Management July - August, 1985
G.	Job Design and Quality of Working Life	James C. Taylor Technology and the Transformation of White Collar Work, ed. Robert Kraut, 1986
H.	End of Forced Retirement Means a Lot to a Few	Kenneth B. Noble New York Times, 10/26/86
I.	The Human Factor	Amal Kumar Naj Wall Street Journal, 11/10/86
J.	Managing Innovation: Controlled Chaos	James Brian Quinn Harvard Business Review May-June, 1985
K.	The End of Corporate Loyalty?	Bruce Nussbaum, et al. Business Week, 8/4/86
L.	Linking New Arrangements and New Work Designs	Harvey F. Kolodny Barbara Dresner Organizational Dynamics, Winter, 1986
M.	U.S. Industrial Relations in Transition: A Summary Report	Professor Thomas A. Kochan Robert B. McKersie Harry C. Katz IRRA 37th Annual Proceedings December, 1984
N.	Everybody-Does-It Management	Nancy Rubin Business Week's Careers September, 1986

	TITLE	AUTHOR(S) & PUBLICATION
O.	Remarks of Professor Thomas A. Kochan, Sloan School of Management, MIT on Implications for Labor Arbitration of Collective Bargaining Trends	Bureau of National Affairs, Inc., 6/12/86
P.	Management Layoffs Won't Quit	John Nielson, Fortune, 10/28/85
Q.	'Worksharing' Is Good	Bureau of National Affairs, Inc., 6/26/86
R.	Presentation by Professor D. Quinn Mills of Harvard University On Role of Labor-Management Relations	Bureau of National Affairs, Inc., 1/21/86
S.	When Employees Make Concessions	Professor D. Quinn Mills Harvard Business Review, May-June, 1983
T.	How A&P Fattens Profits By Sharing Them	Christopher S. Eklund, Business Week, 12/22/86
U.	High Involvement Management	Edward E. Lawler III, 1986

APPENDIX D:
HARDWARE, TECHNOLOGY, PRODUCTION/DISTRIBUTION PROCESS

	TITLE	AUTHOR(S) & PUBLICATION
1.	New Technology and the Factory of Future: Thomas G. Gunn	Restructuring Associates Inc. March, 1986
2.	The Future in Distribution: Bruce Merrifield	Restructuring Associates Inc. August, 1986
3.	Automation and Systems Control and Their Effect on Productivity	K. L. Bibbo/A. C. Warren PA Technology, 1986
4.	Organizing for Productive Maintenance	Paul D. Tomlingson Production Engineering, October, 1985
5.	Building on the Past	Jeffery Zaslow Wall Street Journal, 9/16/86
6.	Linking the Island: Computers in the Factory	Thomas Gunn, Datamation, 2/1/86
7.	Managing for Uptime	Paris Rizzo Thurston Weglarz Manufacturing Technology '86
8.	Automation Could Make the Factory Foreman Extinct	Business Week, 3/31/86
9.	The Mechanization of Design and Manufacturing	Thomas G. Gunn Scientific American, September, 1982
10.	Must CIM be Justified by Faith Alone?	Robert S. Kaplan Harvard Business Review March - April, 1986

	TITLE	AUTHOR(S) & PUBLICATION
11.	Getting Things Done – What's Your Excuse for not Using JIT?	Richard C. Walleigh Harvard Business Review March-April, 1986
12.	Composite Report dated 10/18/85 including: - Making the Most of your Automation Dollar - Sight Makes Right - An Educated Employee is a Best Worker - Small Ticket, Big Payoff - Allan Bradley Makes Contact - Artificial Intelligence is Natural for the Factory - Paying the Bills Without Paying the Piper	T. W. Irvin
13.	Distributors Bow to Demands of 'Just-In-Time' Delivery	Steven P. Galante, Wall Street Journal, 6/30/86
14.	A Breakthrough in Automating the Assembly Line	Gene Bylinsky, Fortune, 5/26/86
15.	AI Commercial Applications	Inside Garner Group This Week
16.	IBM's No-Hands Assembly Line	Bill Saporito, Fortune, 9/15/86
17.	Flexible Manufacturing Systems: Curing the Cure-All	Jeffry Zygmont High Technology, October, 1986
18.	Management Discovers the Human Side of Automation	John Hoerr et al., Business Week, 9/29/86
19.	The Robot: Just Another Machine?	Herb Brody High Technology, October, 1986

	TITLE	AUTHOR(S) & PUBLICATION
20.	GM's Automation Protocol: Helping Machines Communicate	Jeffrey Bairstow High Technology, October, 1986
21.	Technology Can't Solve Factory Woes Without a Change in Attitudes	Robert Haavind High Technology, October, 1986
22.	Automation Needs Speed Up	Business Week, 9/29/86
23.	Needed – New Kinds of Workers for CIM	Roger Draper Managing Automation, August, 1986
24.	Computers That Come Awfully Close To Thinking	Otis Ports, Business Week, 6/2/86
25.	Ushering in Retail's Electronic Age	New York Times, 11/9/86
26.	The Discipline of Innovation	Peter F. Drucker, Harvard Business Review, May-June, 1985
27.	Managing Innovation: Controlled Chaos	James Brian Quinn, Harvard Business Review, May-June, 1985
28.	Linking New Arrangements and New Work Designs	Harvey F. Kolodny Barbara Dresner Organizational Dynamics, Winter, 1986
29.	The CIM Connection	Thomas Gunn, Datamation, 2/1/86
30.	GM's Road Map to Automated Plants	Gene Bylinsky, Fortune, 10/28/85
31.	Food Distribution: The Leaders are Getting Hungry for More	Jo Ellen Davis, Business Week, 3/24/86

	TITLE	AUTHOR(S) & PUBLICATION
A.	Expert Systems are Entering into Mainstream of Computers	William Bulkeley, Wall Street Journal, 12/5/86
B.	Boldly Going Where No Robot Has Gone Before	Russell Mitchell, et al. Business Week, 12/22/86

APPENDIX E: PRODUCT & FOOD TECHNOLOGY

	TITLE	AUTHOR(S) & PUBLICATION
1.	Long-Term Trends in Agribusiness: Professor Ray Goldberg	Restructuring Associates Inc., May, 1986
2.	New Enzymes Improving Way Many Products are Produced	Jerry E. Bishop, Wall Street Journal, 5/16/86
3.	The Single Cook – Breaking the Fast	Carole Sugarman, Washington Post, 6/22/86
4.	- What's New in Food Packaging - Making Morris the Cat Do Double Duty - The Race for Squeezable Ketchup	Philip S. Gutis, New York Times, 6/8/86
5.	Biotechnology & the Milk Glut	Ward Sinclair, Washington Post, 6/23/86
6.	A Japanese Flavor for Campbell Soup	Martha M. Hamilton, Washington Post, 6/22/86
7.	New Uses for Algae Improve Image of a Lowly Plant Group	Brenton R. Schlender, Wall Street Journal, 7/11/86
8.	Food Packaging May be Improved, But Tampering Can't Be Prevented	Trish Hall, Wall Street Journal, 7/16/86
9.	Biotechnology Down on the Farm: The Coming Cornucopia	Richard Brandt, Business Week, 9/15/86
10.	Want Some O.J.? It's Fresh From the Test Tube	Julie Flynn, Business Week, 11/17/86

TITLE	AUTHOR(S) & PUBLICATION
11. A Plant that Glows in the Dark	Laura Mansnerus Katherine Roberts New York Times, 11/9/86
12. Making Wine by the Numbers	Michael Rogers, Newsweek, 11/24/86
13. Filling a Tooth at the Grocer	Annetta Miller, Newsweek, 11/10/86
14. New Packaging May Soon Lead to Food That Tastes Better and is More Convenient	Trish Hall, Wall Street Journal, 4/21/86