From front line associates to Senior Executives, Schonberger has written manufacturing’s action plan for the next decade.

By studying 140 leading edge manufacturers in 9 countries Schonberger has uncovered new data giving you a roadmap on how to transform your business.

This groundbreaking research reveals how the industrial decline and ascendancy through 1950 to 1995 correlated perfectly with 2 key non-financial indicators: Inventory Turnover and Customer Satisfaction.

By moving beyond the old financial indicators that have been used to judge a company’s worth since double-entry bookkeeping was first invented and embracing Schonberger’s 16 key, customer focused principles, you will be able to create true excellence in your area, department or company.

From this summary you will gain key distinctions in the areas of factory layouts to the reason why mass production is not dead. You are about to discover ways to reconstruct human resource management and to fix the broken performance measurement system.

This summary will be indispensable reading for manufacturing and general managers in all industries.

So, read on and learn how you can take your company from adolescence to a dynasty!
About the Authors

Manufacturing Performance
The 80’s and 90’s has brought more knowledge and innovation into the running of manufacturing enterprises than in all the rest of the century. Statistical analysis of the last half of this century shows us how a 25-year decline has turned into a steady rise through a number of new concepts that have transformed the industry.

In the late 70’s and early 80’s the U.S. business press was full of stories talking about the ‘productivity crisis. Case study after case study was created to explain this industry crisis but a simple study of the corporate annual reports told the story with astounding accuracy.

The Reason? Inventory Turnover (cost of sales, divided by on-hand inventory).

Declining inventory turnovers occur when a company has trouble managing its processes. This causes wastes, in the form of inventory, to pile up.

Many of the world’s largest manufacturers experienced sharp to steady declines in this period with IBM leading the field for the longest and steepest decline. However, with the introduction of the Toyota System in the early 80’s inventory turnovers for U.S. companies began to regain ground and by 1986 the rate of improvement was accelerating rapidly.

The Power Of Customer Service
With the understanding of inventory trends you now have a reasonably reliable measurement for the future success of your company or business unit. However, other indicators need to be taken into account.

Although a more difficult business component to measure compared to inventory turns, customer satisfaction cannot be ignored.

Today the standards set by the competition and – more importantly – expected by the customer leave you with no choice but to have an evangelistic focus on customer service.

Today, customers’ needs change more quickly than at any time in history. Your company’s ability to change with speed and flexibility as well as looking to prevent customer dissatisfaction rather than having systems that deal with it are of paramount importance if consistent growth and success is the goal.

Aim to be like Solectron Inc.
Solectron is a company that specialises in assembly of printed circuit boards and subsystems for companies like Hewlett-Packard, AT&T and IBM.

Their customer satisfaction criteria are intensive to say the least. Its customer satisfaction index (CSI) has five service criteria, (Quality, Delivery, Communication, Service and Overall), which are used to grade every customer, every week.

Solectron openly admit that getting this information weekly can be a challenging task and on many occasions needs to be pried from their customers, but the difference it makes is worth it.

Their sales people are measured on the amount of completed CSI forms with 85% being the average. CSI scores below 95% trigger an immediate response from Solectron through improvement teams being organised and corrective action taken immediately.

These teams are so focused on serving the customer that when asked who they work for it is not uncommon to hear the customers name, that’s what I call true customer focus.

Building Strength through Customer Focused Principles
Because financial data is not the best indicator of the strength of a manufacturing company, basic metrics such as inventory turnover, which assess the long-term changes in the strength of your company, are used. But inventory turns rise and fall slowly. Your company needs indicators which point to changes needed now such as customer satisfaction. But to truly move forward you need more indicators.

The Solution? 16 management focused principles that, when focussed on, will turn into a pot of gold for any organisation.

But, before examining these principles it’s important to understand how the shift towards principles has taken place.

Over the years there have been many forms of management, with most relying on superior subordinate relationships that, although effective in some instances, have been shown to be detrimental over the long term:

Management by Edict: Allows subordinates to take orders from superiors. But it lacks in customer outlook, is inconsistent and wastes the talent of the work force.
Management based on Standard Operating Procedures (SOPs):
SOPs find the best way to do something, authorize, record it, teach it and expect it to be followed. This method makes management more systematic and allows quicker decisions, but it still wastes human talent. In certain situations it doesn’t have proper procedures and so can push forward a wrong procedure. It also adversely affects customer service.

Management by Policy: Bases its operations on policies. This type of management partially corrects the shortcomings of dict management and procedure management but it’s usually misguided and inward looking. It also restricts fast organizational learning, particularly when it concerns customer needs. Also, the work force isn’t empowered.

To move management and business forward you must make the leap to management by principles which are customer-focused, employee-driven, broadly effective and, most importantly, enduring.

I’m not saying you should throw out all your procedures and policies and never take charge of a situation if it requires it. What I am suggesting is that principles will survive through thick and thin where other practices have failed. IBM’s Lou Gerstner puts it this way:

“Management by principle means when a situation arises, you don’t go to a manual. You know in your heart and head what to do.”

At the end of the day it’s important to remember that your bottom-line success follows when:
1. You serve your customers impeccably
2. Your team is fully involved, and
3. Your actions are based on systematic data about processes, customers, competitors and best practices.

In all there are 16 customer focused, employee driven, data-based performance principles. They do what is right for the customer and build employee competence and achievement. Essentially they are based on fundamental truths and are the way of the future.

The 16 Principles of Management

The 16 management principles are made for everyone: from frontline associates to the most senior executives. Even though the main focus is customer needs, management principles also meet the primary needs of employees, officers, investors, creditors and suppliers.

Listen up, here are the answers to the new management style you must take on board:

General Principles

Principle 1: Team up with customers. Organize them by families of customers or products that customers buy/use.

This principle doesn’t look favorably upon people who are hemmed in by functional walls or multi-functional project teams. Its main aim is to get the client involved with the project teams and work with these teams. Organizing cells according to products or customers is also a good idea.

For example, Microsoft’s Redmond headquarters has a product-focused cell. The company buys over one thousand units of computers and workstations per month. Therefore, Microsoft’s primary production activity is product focused.

Restructuring the work system according to product families is seen more in factories than in administrative sectors. However, there are occasions when a unit can be both customer and product focused.

Principle 2: Capture and apply customer, competitive and best practice information.

It’s important that you obtain 3 vital sources of external information:
1. Run customer surveys and involve customers in expressing their opinions and helping to design the company’s products and services.
2. Analyze the competitor’s products by collecting samples and categorize the results. The best method to meet the standard of a competitor’s products is to confront all employees with that product.
3. Find the best ways and methods of doing anything, including generating new products or improving administrative procedures or issues such as contract negotiation or building maintenance. This is called best practices. Sometimes, going out of one’s own industry to look at another industries’ method of operation can be invaluable.

Principle 3: Dedicate to constant improvement in quality, response time, flexibility and value.

Aim towards excellence in quality and providing products on time. Quicker response includes time-to-market, cycle time through the plant, delivery time and service recovery time when things go wrong.

The number of jobs mastered measures the human resource flexibility. Also a firm’s capacity to decrease or increase its labor capacity according to demand shows how flexible that firm is. Don’t forget about equipment flexibility, such as the ability to move equipment as well as speed of setup and changeover.

When customers shop for value, they look at how much quality, speed, and flexibility (QSF) they get for their money.

Principle 4: Frontline employees involved in change and strategic planning to achieve unified purpose.

An example of this principle is Zytec Corporation. The firm formulates a five-year strategic plan and one-fifth of the work
force revises and criticises the plan. Here each worker is involved and establishes a personal monthly production goal.

Design

**Principle 5:** Cut to the few best components, operations and suppliers.

Cut out wasteful practices in product design and delivery. The key is to use fewer components in number and in variety therefore improving costs and performance.

Also, cut down on the number of suppliers because it cuts many wastes in purchasing. Too many suppliers prevent the organization from establishing any firm partnerships with any of the suppliers.

Operations

**Principle 6:** Cut flow-time, distance, start-up and changeover times all along the chain of customers.

The old management systems never paid attention to speed and flexibility. The emphasis was always on productivity and efficiency. Speed and flexibility are the main principles of Just-In-Time methodology. This methodology advocates production that is timely and produces as much as needed in the right time required.

**Principle 7:** Operate close to customers’ rate of use or demand.

Why? Synchronization. This is done in two forms:
1. Produce and deliver according to the actual size of sales, which minimizes inventories.
2. Produce at the rate of recent average demand.

**Human Resources**

**Principle 8:** Continually enhance human resources through cross training, job and career-path rotation, and improvements in health, safety and security.

This principle calls for continuing high commitment to training, in process improvement methods as well as job skills.

The Institute for Productivity Improvement, based in Oakland, specializes in teaching process improvement methods to employees of small manufacturers. Other organizations use concentrated training but very often this is not effective. Too much training in too little time never is.

However, the Institute does the opposite and employs a training method during which a topic, such as quick setup is taught and then the class is sent back to their work places to have hands-on practice. When the class meets next time the successes and difficulties are reviewed. Then it launches a new topic and the learning cycle repeats.

This kind of training has spectacular results. The protective side of this principle requires upgrading employee health, safety and security. Failure to develop and protect human resources is wasteful of the company’s prime asset. This principle has great value even for businesses that spend as little as possible on their HR department.

**Principle 9:** Expand the variety of rewards, recognition, pay and celebration to match the expanded variety of employee contributions.

Publicly praise and recognize the accomplishments of your employees. This kind of rewarding will empower your team and motivate them to master further skills in their fields. Even though public recognition and praise of employees is an easy thing to do, it’s still not widespread.

A sample of the successful implementation of this method is Hewlett-Packard’s Malaysia components facility. They have an attractive ‘wall of fame’ where the photos of the most accomplished employees are displayed.

They also have a display of best ideas from improvement teams in each area of the plant. Displays like these motivate individuals to strive for further achievement.

Reward them like Quickie

Quickie Designs, is strong in the principles related to employee involvement and recognition. In the employee recognition area Quickie has awarded a new car annually to an individual for the past four years. The award is based on a lottery drawing, but the odds of winning go up for associates whose names go into the hopper for good deeds and good ideas.

In 1992 a temporary employee who had 57 pieces of paper with his name on them – for 57 contributions – won the car. That person is now a full time staff member.

**Quality and Process Improvement**

**Principle 10:** Continually reduce variation and mishaps.

Variation and mishaps of all kinds are prevented by properly using statistics, measurements and facts. This principle is all about quality and process improvement.

**Principle 11:** Frontline teams record and own process data at the workplace.

Responsibility without authority is hollow. So if all employees and teams take responsibility for their processes, then they must possess the data pertaining to those processes. How do you do this? Managers, engineers and other experts must give up their ownership and at the very least they must have secondary, not primary access to the data.
Principle 12: Control root causes of cost and performance, thereby reducing internal transactions and reporting. And simplify external communications.

Most internal transactions arise because things are too complex, random, failure prone or variable. Quality management takes out variation and failures and the many transactions and reports that go with them.

For example, in the 80’s computer transactions in Applicon fell from 30,000 to 800 per month because they removed their best product from the muddle of other products. And MK Electric in England adopted rate-based scheduling for its key products and cut its scheduling transactions from 1600 to 1 per week.

These companies have also simplified communications with external partners through electronic data interchange, fax and other data links. These technologies convey such data as requirements to suppliers, point-of-sale and after-sale service data from customers, digital design information to design partners and funds transfers among all parties.


Install QSFV as the dominant measure of success in operations. A producer of monitored security systems – Sentrol – has the right idea. Each of its 13 product-focused cells has its own visual display of results.

It includes a cross-training matrix, defects graphs, line-scrap graphs, a monthly quality chart, a weekly quality chart, a quality indicator, a customer-service graph, and a schedule-performance graph.

As the customer-oriented metrics rise in importance, the old inward looking ones, such as productivity, efficiency, utilization and cost variance fade. Effective management of operations focuses on root-cause analysis and first-order results.

Capacity

Principle 14: Improve present equipment and human work before considering new equipment and automation.

This and principle 15 are all about capacity. Look at what you’ve got at hand and what human and physical resources you’ve got before going out and buying expensive equipment and machinery. Also standardize processes and get more out of the existing machines by ensuring machinery is consistently and frequently maintained to a high standard. Also eliminate wastes in operation.

Principle 15: Seek simple, flexible, movable, low cost, readily available equipment and work facilities in multiples, one for each product/customer family.

Decisions on purchasing main equipment should not be made rashly. Manufacturing engineers rush out to purchase a machine that can handle the projected demands for the next three years, failing to consider the following:

1. Customers order many items in the product line at the same time. But the big fat machine can only make one item at a time.
2. Each time the machine runs, many lines and staff are involved. So it becomes more uneconomical to produce small amounts.
3. Large lot productions create excess inventory and stock the warehouses. Usually there’s plenty of stock of the unpopular items.
4. A costly machine cannot sit idle, so it works over-time and overproduces. Such overproduction creates excesses that need to be managed, stored and warehoused. This means needing extra space and staff to handle the excess.
5. While getting full usage from the equipment, maintenance is often ignored. Therefore, there’s more chance of breakdowns and eventually less output. All this leads to an undependable service to customers.

The ideal method is affordable equipment in multiples. Equipment that is easily set up, maintained and relocated. The equipment must be flexible in order to respond to customers’ needs.

Promotion and Marketing

Principle 16: Promote, market and sell your organization’s increasing capability and competence – every improvement (the results of the other 15 principles).

Customers today want continuously improving qualities. They also want partnerships, open communication and dependability. Customer-focused principles applied throughout an organization meet these customer needs.

The 16 principles Applied

127 manufacturers were researched in this study. The top firms where seen to be flexibly equipped, synchronized, high-recognition manufacturers.

1. They usually gravitated toward flexible equipment in multiples (Principle 15).
2. They got synchronized with the customer chain (Principle 7).
3. They recognized and praised the contributions of their associates (Principle 9).

These manufacturers’ weakest points lay in the following fields:

2. Measured improvement in quality, speed, flexibility and value (Principle 3).
3. Reducing parts and suppliers (Principle 5).
4. Reducing variation and mishaps (Principle 10).
5. Cutting transactions and controlling through simplicity and root cause correction (Principle 12).
7. TPM and process simplification (Principle 14).

Forging Ahead

Once again it is important to point out that all 16 principles point in the same direction: customers and how to better serve them. Make no mistake; taking your company on the path of excellence by focusing on improving these principles is not the easy path to follow. But it’s better to face the inevitable obstacles that come through change and growth than to ignore them.

For example, if you compete only locally and have done well at it, your biggest obstacle may be complacency. One way to change this is plant visits and getting the masses educated in the concepts and techniques of customer-centered process improvement.

Strategic change is an outcome of all 16 principles. Senior executives should not be sole owners of strategy. Step-by-step improvement on each principle transfers strategic powers to the organization and its stakeholders. This is the ultimate challenge and one that will move your organization forward.

Improvement Pathways

Each company unit that participated in this research has its own story on how it reached its current level of achievement. Alliedsignal Aerospace Equipment Systems in Tempe, Arizona is no exception. The plant has 1,670 employees and produces accessories for missiles and undersea vessels.

The Tempe site has excelled in getting its equipment and organisation aligned with product flows (Principles 1 and 15), in care of its physical plant and equipment (14) and in employee ownership of process data (11).

The changes took place in 1990-1991 with the main issue being the cutting of machine setup times to make improvements to cycle times. A local consultant provided initial training. A group of six engineers that were experts in quick-set-up procedures trained others and facilitated one project after another.

In late 1992, consultants developed a corporate wide training program called Total Quality Leadership. Every company employee went through the 4-day training and everybody walked out with a project (Principle 8).

In 1993 Total Quality Leadership became Total Quality Speed (TQS) and another round of training and implementation was generated. In 1995 another program was established and that customized the improvement efforts in light of each site’s needs.

Then, ‘natural teams’, not departments, went to work on the issues while maintaining clear ‘sightlines’ to the site’s needs and goals. The number of teams will grow to perhaps 200 at the Tempe site.

Case Study: The Costing/Pricing Problem at Harbour Metal Stamping Company

At Harbor Metal Stamping overhead is charged to products based on machine hours. But this method results in over costing and overpricing for high-volume parts stamped out on Harbor’s 600 and 750-ton presses. On the other hand, most low-volume parts are undercosted and under priced.

Initially they simplified Harbor’s production and inventory control system. This is what they did:

1. Attached a formal kanban using labeled containers,
2. Formed temporary work cells for medium-volume work,
3. Created more permanent cells for higher-volume – ‘star’ – products,
4. Established more regularized, daily-rate schedules for ‘star’ products and components,
5. Created work-in-process stock on the factory floor (closed down stockrooms),
6. Re-assigned excess staff to production, technical support, sales, supplier development, and factory renewal and reorganization projects.

Then they checked costs, revised prices and weeded out money losing products.

But that’s not all; next the Harbor cost system was modified. They first divided factory overhead into two:

1. Technical support,
2. Production and inventory control support.

Then the computer information system was also divided in two:

1. Administrative support,
2. Factory support.

Then all of this was recombined. And after all the improvement steps were implemented the costing system became much more accurate and is now a good deal more accurate than most companies.

Agile Production or Lean Manufacturing

The old method of mass production was to produce in large quantities, break those quantities into separate heaps and produce them in various unsynchronized production methods. Thus, partially completed components piled up all over factories and filled up the warehouses and created excesses.
“Flexibility is said to be the ability to react to planned changes, whereas agility is the ability to react to unplanned changes.”

The ability to respond quickly to life cycle shifts is called high agility. But the life cycle of many products is hard to predict. Some products endure and some don’t. When a product runs down slowly, the supply chain can react and avoid costs of dead stocks. Producers can introduce new products or models to keep capacity busy. However, when a product line dies the costs and losses can be very high.

It’s an obvious fact that the main bulk of costs are in the components. A company must produce multiple variations and extensions of a product to recover these costs.

“That is where the success formula lies: mass produced components that can fit together in a wide variety of combinations.”

The sure road to agility is mass-producing modular components, then employing data communications and advanced production technology at the end to put them together as the customer sees fit. This new method of mass production is called ‘agile’ or ‘lean’ manufacturing.

The New Mass Production

A lot of companies are currently working on the lean manufacturing system. Johnson Controls has applied the same formula to its car-seat plants. The seats are produced in various models but the components are commonized. This method controls production costs.

General Motors is working along the same lean manufacturing system. It downsized its staff from 13,000 to 1,300 people and the midsized models that came out in 1,900,000 combinations in 1988 were about to be down to 1,000 combinations by 1998.

The situation is the same in the Aerospace Industry. The trend is to design airplanes with fewer components. In Boeing’s old approach, different engineering groups passed the design project back and forth, each adding more parts to meet their own requirements. Boeing’s current team approach in designing the 777 aircraft eliminates the adding of more parts and manufacturing difficulties.

Firms engaged in the process industry are changing their methods to the lean manufacturing system. Milliken’s Virginia plant has designed its chemical plant differently. It has established two reactor groups instead of just one. The larger group – which handles large orders – can act more like a mass producer; and the smaller group concentrates on small-batch orders.

Mass production is not dead or dying. In fact, it is enjoying rejuvenation, because lesser forms of high-volume production are becoming ineffective. And we’ve also learned to apply mass production – with all its advantages – to early production stages and save customization to the last stage.

Customization and agile or lean manufacturing has become the new path for the manufacturing industry and its guide towards high achievements.

Modular Assembly is the Way of the Future

Benefits of modular assembly are experienced in many ways; cutting wastage and excessive stock warehousing are just a few.

Products that have too many parts can especially benefit from the new modular assembly system. For example, Boeing’s engine buildup factory in Kent has shifted from loose parts to preassembled modules. The specifications for hundreds of parts that had to be hung on the engine were too many for the assemblers to master causing defects to occur. The change has helped this problem immensely.

Quick Response (QR): A Revolutionary Innovation of Management

When we look at a manufacturing company we see two entities. One entity specializes in production and the other in distribution. The two hardly communicate with each other. This creates a communication dysfunction and results in poor customer service and misguided product decisions. Products get made and shipped but often the wrong ones at the wrong times.

Most manufacturing companies have the same problem. They are divided into the production and distribution. The distribution section – sales and marketing – is unaware of the productive capacities and capabilities of the production section, while production has no access to customers’ needs and goes ahead with its plans to suit its own interests.

Communication between production and distribution can be improved by applying the Quick Response (QR) Program.

Basic QR requires that producers receive point-of-sale data from selected stores. Point-of-sale data samples can be used by manufacturers as their production schedules. Conventional scheduling used to always be weeks or months out of date.

QR and related ideas seem to be the most potent method of collaboration. It might go down in history as one of the twentieth century’s most important management innovations.

Multifunctional Product Strategy (MPS) Teamwork

Close supplier-customer planning may eventually become common – at least for superior companies. But what if – right
now – your company can’t find willing partners? Can anything be done to internally link the production and distribution companies?

Yes. The first step – something many manufacturers have already done – is to create plants-in-a-plant and also work cells. Each is organized around a product family. This is reengineering at the operational level. To do it right each product family must have its own cross-functional team called the Multifunctional Product Strategy (MPS) team.

At a minimum, team members should come from sales and marketing, finance, and production. In some cases product development, purchasing and human resources staff should also be part of the team.

One of the team’s roles is to act as a super ordinate master planner. In that capacity it meets often, perhaps weekly. It decomposes the order book or recent sales, which nearly always contains a mix of high-profit, low-profit and loss items to all the customers.

When business is slow, the company gladly does business with difficult customers. It will sometimes even sell at a loss to help cover fixed costs. When average demand exceeds capacity the team looks for best ways to refuse or divert business. This may include stretching out deliveries or response times to the point where the customer begins to look elsewhere.

Many organizations are thriving on the teamwork of MPS. Firms that have used this method reveal advantages like discounts for high volume, leveled buying, simplified stock management, pricing, advertising and employee training. Everyday low pricing (EDLP) is one of the major advantages of MPS teamwork.

The new strategy calls for leveling demand. This more closely matches the patterns of real customer use, cuts a lot of administrative costs and produces big capacity-management savings.

**Outsourcing**

Outsourcing is hiring out outside personnel and temporaries to handle demand. Temporary staff can ease the firm through seasonal peaks and sporadic ups and downs.

Outsourcing is an important way for your company to concentrate your own work force on the immediate tasks at hand.

The advantages of outsourcing include:

- Product development can be contracted out,
- Outside help for works such as janitorial and food services can be brought in,
- Tasks such as computing, payroll or equipment maintenance could be turned over to outside specialists,
- Services of temporary employees and contract computer programmers can be used in project work.

Along with the advantages of using casual labor there are also disadvantages. Here are some examples and ways to fix the inevitable challenges that will come up:

- The cohesiveness of the work force can be disturbed.
- You will need to establish some kind of stability in hiring temporary staff.
- Call upon the same people, who have done the job well, and create some type of stability. The instability in the supply of temporary work force creates insider-outsider culture clashes.

World-Class manufacturing in the next decade will be a strategy of wholeness and linkages. It will reject the old one-dimensional fractionated business school view of one thing at a time.

Being quick to pounce on new products and processes is one element of success in the next decade. Your company must be equally adept at capturing important new manufacturing management concepts. It seems likely that the next decade will unearth and unleash another five or ten such innovations (as well as numerous renamed old ones).

Regions that have not done so in the past will be among the contributors. It is to be a global decade. At this point, predictions on the content of the new ideas would be pure speculation. What is important is not to be able to guess the future, but to be among the first to know.