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Let's Fix It!

Overcoming the Crisis in Manufacturing

By

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Management: The Differentiator

Earning and market share are inadequate. They tell where the company was, not where it is going. All too often a company has its best year ever and two or three years later is in a death spiral.

Good management is the differentiator. Even economists, who are given to explaining all economic twists and turns in terms of fiscal and monetary policies, have been forced to recognize that management can make a difference.

Inventories: Proxies for competitiveness

Of all the pointers of strength or weakness that might be gleaned from a goods-oriented company's financial records, none reveals quite so much as trends in inventory turnover.

Reducing inventory and getting lean frees up cash and raises inventory turnover. Managers simply reduce inventories, without acting to cut wastes and delays, they remain fat –bad!

To justify the label world class, all the principles and five-step scoring criteria have the same over-arching three-part theme: they are customer-focused, employee-driven, and data (fact)-based. The intent is that they define competitiveness not by today's standards, but by the much elevated standards sure to arise in the future under unfettered world commerce.

Overcapacity and Under-management

In other manufacturing sectors, if there's no money to be made anymore, the main reason is global overcapacity: too many carmakers, paper mills, foundries, and textile/apparel companies. That goes for services, too. There is excess capacity in banking, insurance, leasing, health care, airlines, movie theaters, and government agencies.

Decline

Inventory turnover is a performance collection point for much of what an inventory-intensive business does.

- **Quality.** What may be the most widely quoted reference on quality in the last two decades is not a journal article or book. It is a 1980 documentary on U.S. television: NBC's two-hour prime-time *News White Paper*: "If Japan Can, Why Can't We?" Manufacturing's dirty little secret, its sad state of quality, was out in the open. The top items in Exhibit 3.1 reflect those quality woes and their inventory effects:
 - **Rework and Scrap.** Every unit of bad product, to be reworked or scrapped, ties up that much inventory.
 - **Unpredictable quality.** More inventory must be on hand just in case the next lot is bad—the unpredictability factor.
- **Unpredictable equipment.** With poor maintenance, machines won't make good parts, adding more inventory in a state of rework and scrap. And still more just in case the equipment totally breaks down—the unpredictability factor again.
- **Inflexible labor.** Training costs were another easy target. Without sufficient training, the workforce has less flexibility to move to where the work is. So manufacturers keep people busy in place, making more and more parts for orders pushed ever further into the unpredictable future.
- **Long changeovers/large lots.** Changing over a production line or setting equipment for the next job requires extra skills. Reduce the frequency of changeovers and setups via longer production runs of each job, driving inventories still higher.
- **Functional layouts and long flow paths.** Narrowly trained employees cannot operate multiple kinds of equipment.
- **Unsynchronized scheduling.** Kanban system.
- **Storing small quantities line-side,** with no trips in and out of stockrooms and no transactions, would come later as part of the Toyota system.
- **Complex, many-part designs.** Engineers will feel it's their job to redesign every part. Marketers, if left to their own devices, keep adding features, sizes, and colors, and each must be stocked—still more inventory.

- **Many suppliers/customers, little coordination or data sharing.** With uncertain quality from suppliers, companies protected themselves by lining up multiple sources. For cost, quality, and delivery reasons, companies would play one supplier off against the others. The upshot: Each supplier had to hold high inventories in case they should be favored with the next big order; suppliers' inventories grew under this industry-wide way of doing things.
- **Marketing-induced spiky demand.** Cut the price and get people to buy more than they need. Then, however, customers will not want to buy again for some time. A cycle of up-and-down demand spikes is the result.

Ascendancy

- Less rework and scrap.
- More predictable quality and equipment.
- Flexible labor.
- Quick changeover/small lots. Less lot-size inventory
- Synchronized scheduling/logistics. Visual kanban tightly links feeder and user work centers.
- Line-side storage, direct shipment. On-site feeder work centers and off-site suppliers deliver right to production lines.
- Use standardized parts, unless there are good reasons not to. Fewer parts to manage means less overall inventory.
- Fewer suppliers/customers, high coordination and data sharing. Fewer suppliers give trust and data sharing a better chance.
- When marketing and operations are on the same page, inventories shrink.

Lean is not the absence of inventory; it is the absence of high expenses related mostly to slow, wasteful movements of inventory through the company pipelines.

Customer retention is a strong measure.

- 95 percent customer retention over a five-year period
- 99.6 percent customer retention over a four-year period
- 100 percent customer retention over a five-year period

If present customers stick with you, you must be doing things right. Whole new markets—have opened up for products or brand names not seen before. In some cases retention may be less vital than new customer attraction.

Speed, for example, includes time to market, cash to cash, setup time, order-fulfillment time, supplier lead time, and more.

Your industry trade group may provide benchmarks to compare with your own. International Benchmarking Clearinghouse, apqc.org; The Benchmarking Exchange, benchmarking.org; the ASTD (American Society for Training and Development) Benchmarking Forum, astd.org; the National Association of Manufacturers (United States) and its benchmarking services; or others.

By demonstrating a certain level (means) of competence on a given track, a company receives points.

World Class by Principles (WCP) system of assessment and improvement advocates “proven,” time-tested, widely accepted best management practices.

Who would argue against continuous process improvement; high levels of employee involvement; quick, flexible response; or getting lean?

The WCP has several unique features, as follows:

...the per-play approach embodied in the WCP follows the premise that if you do the right things, and stay with them, the bottom line will take care of itself.

Stability

Core. The enduring core concepts are customer focus, a turned-on workforce, management by fact, and continuous improvement. All of the sixteen principles making up WCP have features that incorporate these four core concepts.

Techniques. The enduring techniques are work cells, kanban, small-lot production and transit, quick setup/changeover, the seven basic tools, design for manufacture and assembly, basket of values, target costing, value engineering, take times, process capability index, quality function deployment, cross-careering, and many more.

An enduring and stable system builds on a special kind of framework: one focused on universal customer wants. As noted in Chapter 3, those wants are ever better quality, speedier response, greater flexibility, and higher value. By universal, we mean that all customers, internal (next process) and external (outside user), value them.

Pockets of “World Class.”

Exhibit 5.1 is a flow diagram that shows a large number of possible pockets. It also shows how a small-pocket action (any box) can trigger little chain reactions. The cause-effect arrows flow from any action to the final objective, the box on the far right.

None of the pocket initiatives is risky, and the only one in Exhibit 5.1 that costs real money is better equipment selection.

...there are two that vastly outshine the rest in total impact: the two at the extreme left.

...everything else falls into place naturally. Products are what customers buy.

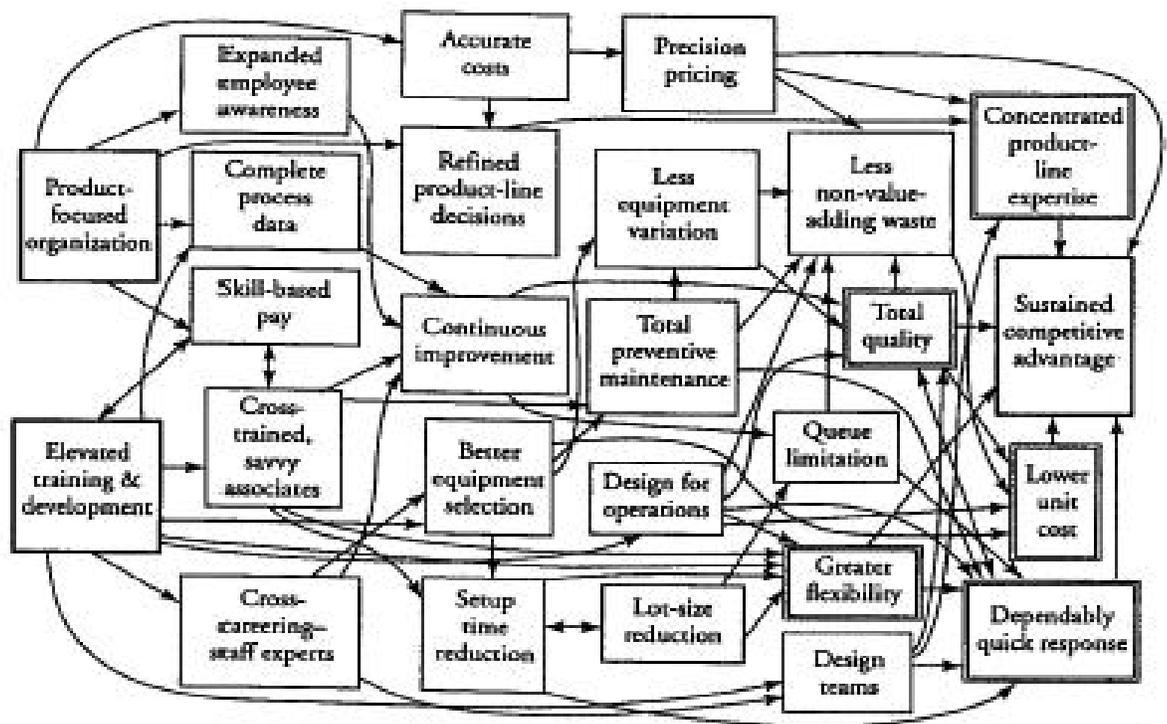


Exhibit 5.1. Interlinked Manufacturing Agenda

The pockets in Exhibit 5.1 are all elements in the world-class journey.

Manufacturing Failures

“You can be sure if it’s Westinghouse”. Today, you can be sure Westinghouse no longer makes anything. ...its demise, as one of the world’s premier manufacturers along with that of International Harvester.

The Fallen

While the manufacturing side of the company had its head on straight, senior management had stars in its eyes. After a few years of buying TV and movie studios, Westinghouse’s fortunes began to sink.

Not Built to Last

Consider the following companies. What is special about them? **They are among yesteryear's most admired corporations.**

CBS

Digital Equipment Corp.

Dow Jones

Du Pont

General Motors

Hallmark

Hilton

J.C. Penney

Kodak

McDonald's

Pan Am

RCA

Reader's Digest

Sears, Roebuck

U.S. Steel

Westinghouse

Yesterday, Today, and Tomorrow

CBS, the Tiffany network, made TV what it is. Dow Jones was in the catbird seat as a repository of investor news. DEC was the highest flyer of high tech. Du Pont was "better living through chemistry." General Motors invented, and was past master of, the business world's most influential form of decentralized line-staff organization. Hallmark was nirvana for commercial artists and where you went for a card when you "care enough to send the very best." Hilton was to hotels as Callas was to coloratura arias. Penney, perhaps the first company to call its people "associates" (dating back to 1902), was where retail folks wanted to work. Kodak prints were what you grabbed first if your house was on fire. Generations of families were raised on McDonald's dependable fare. Pan Am was to air travel as Hilton was to hotels. RCA, an electronic technology Vesuvius, was dominant in home radios and TVs. Reader's Digest had coffee table prominence. Sears, Roebuck had pioneered a form of empowerment via a very flat, broad-span-of-control organization structure—and, according to rural mythology, its catalogs were staples in America's outhouses. US Steel, the elephant in the industrial menagerie, and on the Westinghouse "You can be sure [of]."

Fast forward to 1994. Stanford professors James Collins and Jerry Porras revealed a different set of "visionary companies,"...were built to last. American Express, Boeing, Citicorp, Ford, General Electric, Hewlett-Packard, IBM, Johnson & Johnson, Marriott, Merck, Motorola, Nordstrom, Philip Morris, Procter & Gamble, Sony, 3M, Wal-Mart, and Walt Disney.

Fast-forward again to, say, 2020. At least two of these sixteen will have shot themselves in both feet, a la Westinghouse or, worse, Pan Am.

Industrial Ranking

The main message of this chapter is that success goes to those that learn.

Building an all-Company Human Improvement Engine

1. All front-line employees receive application-linked training in process improvement and “sense of the customer” view of competitiveness.
2. All employees gather process data.
3. Via data collection, employees become process managers.
4. Formatted data point to root causes.
5. Solutions become suggestions, often implemented by suggestors.
6. Trend charts in the workplace track direct-effect results.
7. Recognition closes the loop.
8. Derivative intrinsic rewards equal monetary awards in motivational impact.

Total Continuous Improvement

1. **Training.** The problem-solving process itself; and the customer-focused keys to competitiveness: quick response, elimination of non-value-adding activities, nearly perfect quality, cellular layout, cross-trained teams, and so on.
2. **Application.** Application starts with all employees becoming data collectors. The record every glitch and hiccup in their processes.
3. **Process ownership.** Employees taking control instead of having it bestowed upon them.
4. **Data to information.** The collected data readily rearrange into Pareto charts.
5. **Suggestions and their implementation.** In analyzing the data, the work teams generate suggestions.
6. **High-visibility trend charts.** Operators plot the direct-effect impacts of each improvement. The charts visibly mete out praise when the trend is in the right direction, and they scold any long absence from another trend-extending improvement.
7. **Recognition and celebration.** Various informal and formal kinds of recognition follow.
8. **Intrinsic value.** The employee’s heightened intrinsic feelings of self-worth. ...are much cheaper than pay raises, bonuses, and other monetary rewards.

Labor Productivity

The workforce wants feedback. Wants to know how it is doing.

First one that comes to the mind of management is productivity. One measure of it is simply units produced in the period of measure. Others are units against plan, units per person, units per direct-labor hour, and actual hours versus standard hours. Posting these measures, however, has no valid purpose.

...it has a manipulative aura, especially when great numbers trigger ice cream for all. Even school kids know manipulation when they see it. More important, productivity looks like someone else's goal, not ours.

Bring it down to the level of people and processes and what actually allows/does not allow them to be productive.

Confused Connections

Senior management tells me, the supervisor, that unit costs must fall by 5 percent. No problem. I just put of training, maintenance, and operator involvement in problem solving and prohibit use of overtime until the cost drops by 5 percent. No overtime means some customers will not get their goods on time, and my other actions will, before long, recoil in the form of growing incidence of quality, machine, and operator error problems. But I will have made my numbers

...being in so small a business, the pizza shop employees had nearly total visibility. They could see every customer, hear every ring of the cash register, and note every burned pizza or wrong order.

But this is the exception. Put, say, fifty or more people into a business, throw in multiple shifts, staff departments, and a diverse product line, and clouds of confusion roll in. No more clarity of cause and effect.

Sphere of Influence

What can be done in the latter situation—the normally complex manufacturer? Best answer is to build performance measurement around what is within the sphere of influence, or zone of attention, of each employee.

The trick is to seed low-level spheres of influence with business-success factors; then, measure successes within the low-level spheres and follow with recognition and reward.

The quest for zone-of-influence measures must extend to the knowledge employee.

Frequency of Review

The workforce certainly should be kept abreast of the state of the company. In most businesses, a semiannual report delivered to all employees is probably about right. Senior executives review their favorite measures of value—sales revenue, earning, return on equity, stock price.

What's going on in the process? What are the critical process failures? What is being done about them? How can the processes be improved? And how are they being improved?

	PROCESS	BUSINESS UNITS/ DEPARTMENTS	WHOLE COMPANY
Time Relevance	Immediate Direct effect	Semiannual or Annual	Multi-year Trends
Typical Measures/ Topics (examples)	Mishaps Scrap and Network Flow time and Flow distance	Unit costs Sales per Employee Downtime Warranty costs	Company-wide Initiatives (how they are faring) Sales revenue Earnings

Limited Role of Money

...the plastic trays that hold hundreds of small fasteners and other hardware have the per unit cost marked on every tray.

The budget should be everybody's business. At the corporate level, the finance department must manage cash, arranging lines of credit or selling stock when necessary to ensure that bills can be paid and programs launched. Middle managers and supervisors have line-item budgetary responsibilities and must keep tabs on expense buildups as often as weekly

Manage the customer-sensitive processes, and monetary results will take care of themselves.

Decline of Control

Henri Fayol, the original management theorist, said controlling is the fifth of five management functions. His other four are planning, organizing, commanding, and coordinating. Robert Anthony cited hierarchical framework for running an organization consists of strategic planning, management control, and operational control.

Contrast: Direct-effect and conventional Performance Metrics

Labor Productivity

Direct labor no longer has meaning. Say that your plant measures DL productivity for the usual reason: to raise it, thereby lowering cost, thereby attracting more revenue and making more profits. Easy ways to raise it include the following: Take away

responsibility for quality and give it back to rehired inspectors. Return responsibilities for machine setup and preventive maintenance to the maintenance department. Hire more people as materials handlers so that operators are free to just produce. Transfer data collection and all team-based process improvement back to quality engineering production control, information technology, human resources, and other staff department. We need not go on.

The righter we do the wrong things, the wronger we become.

Unlike labor productivity, overall equipment effectiveness (OEE) is a component of a worthy package of excellence tools.

OEE: Its Limited Value—an Example

Overall equipment effectiveness is, a spin-off metric.

TPM blends with other elements of total process management—training quick setup, kanban, 5S, quality, visual management, and others.

Overall Performance

(What needs to be measured) Overall equipment effectiveness. Its formula: $OEE = A * B * C * 100$. A stands for equipment availability, B for process efficiency, and C for an index of quality. Availability, in turn, captures downtime losses from break-downs and setups/ adjustments. Efficiency nets speed losses from minor stoppages and slowdowns. A quality accounts for rejected units and yield losses.

We Did Our TPMs”

Under TPM, operators have a voice in selecting equipment—and may be sent to the equipment maker’s school to learn about maintaining it. Operators record causes of every equipment malfunction. They generally take over the job of changing over the equipment and maybe ordering parts for it. They make simple repairs and assist maintenance in more difficult ones. And more, though it takes times for these roles properly to be absorbed by operators.

Total quality requires shifting prime responsibility for quality from inspectors to operators. That is well-known. Total PM is similar. It requires transferring ownership of equipment from maintenance and engineering to the same front-line associates. That is the reason and meaning of the leading word: total.

The main criticism of OEE, however, is this: Instead of tracking OEE, why not keep score on each component? Pay heed to breakdowns (more important, their causes), setup-time losses (better yet, setup times themselves and causes of losses), and so on. Each such OEE component is where the action—and real information content—is.

The utilization measure is useless, since there is not “right” degree of utilization. In contrast, the higher the OEE the better. That is because of OEE’s three factors. The A factor in OEE is not utilization, but availability: Is the equipment available (and operable) when needed? If not, customers will be poorly served. The B and C factors, efficiency and quality, also get at the interests of customers. Utilization does not.

Persist in the same product line and mix too long and you end up like the proverbial buggy-whip maker at the advent of automobiles. To avoid this, most manufacturers, at some point, need to undergo a makeover: acquire or merge, while selling off the “buggy whip” assets. Emerson Electric, suffering angst in recent years over lack of rewards in the stock market, refocused its acquisition formula. Instead of adding more old-line industrial companies, it is bulking up on higher-tech manufacturers having greater profit and growth potential.

Focused Plant Design

Multipairs of chess players hunch over small wooden tables in one of the open-air, sit-and-play street alcoves in downtown Santiago, Chile. A ten-year-old aficionado licking an ice-cream cone walks by, pauses at the corner table, and after a quick glance says, “El banco ganara” (“White will win”). How does she know? Because white’s bishops have taken command of the longest diagonals, and its pawns and pieces sit so as to carefully guard each other. In its fifteen-hundred-year existence, this game’s complexities have been thoroughly streamed, stirred, and strained. A casual student of the game will know this strategic truth: Chess is positional.

Manufacturing is positional, too. World-class manufacturing, at a young age, is still evolving. It is hard to find documentation on its strategic positional norms. However, a competitive plant is like a competitive chessboard. Experience teaches right positioning. Plants should be neither too big with too many people and part numbers nor too small with too few. Plant shapes and flow patterns, and nearness to other facilities, make up further positional rules of thumb.

Why So Big?

A plant small in size with few people and items is simple; a large one with many people and items is complex.

...upper size limits hold rather well:

- * Maximum area: 200,000 square feet (18,600 square meters)
- * Maximum number of people: 500
- * Maximum number of parts or stockkeeping units (SKUs): 2,000

Shape and Flow

Assuming the factory is not too big and is somewhat oblong, the next issue is placement of facilities for efficient flows. Here the rarely seen ideal is for each U-shaped cell or line to have its own ship and receive docks. In other words, locate each cell/line on one of the

four walls or building corners. Conventional layout, receiving at one end of the building and shipping at the other, has no merit.

Cell/Line Design

The newer wisdom, now well-known, is this: Strive for U-shaped or serpentine wherever feasible. Advantages include the following:

***Flexibility.** One person can run an entire cell with little walking, or load the cell with a person at each station.

***Closeness.** A linear production line stretches people out: no team sense. A U shape brings operatives in close, facilitating cross-learning, job rotation, mutual assistance, joint problem solving, and peer pressure—as well as social interaction.

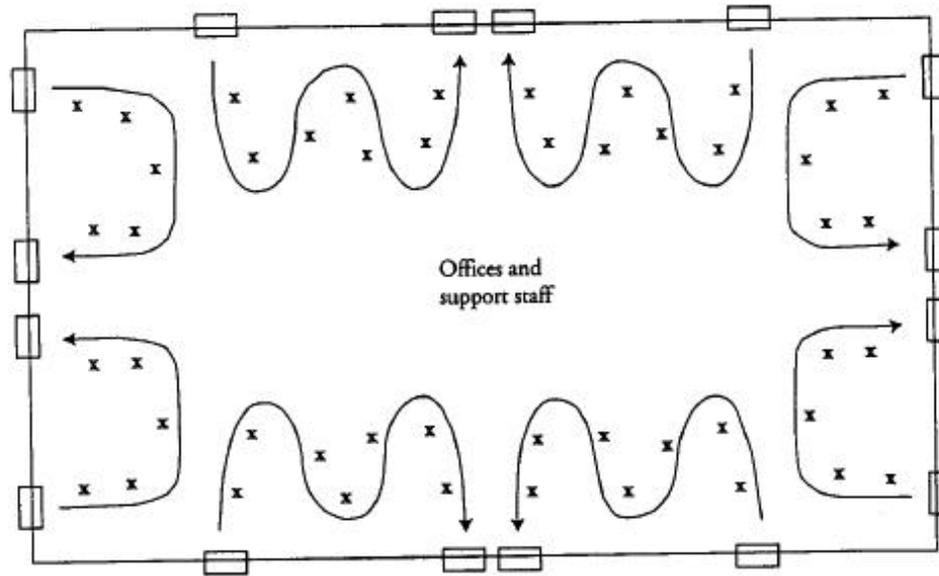
***Passage.** Straight lines inhibit transit of materials, people, and tools. Bending long lines around themselves compacts it all, which opens up passage and offers accessibility around the perimeter.

***Linkages.** U/serpentine shapes offer many options for linking to other cells or lines, storage, and docks. When modest-size buildings have docks opening on all sides, the factory may resemble Exhibit 9.1: cell end points are receiving and shipping docks.

***Rework.** A tenet of quality management is to retain and process rework at the source. With bet lines, discovered defectives pass back across short distances to the offending station.

***Configuration.** With U/serpentine shapes, adding or deleting work stations just requires increasing or shrinking the arc, as illustrated in Exhibit 9.2. The exhibit also shows a common elaboration of a cell: a subassembly or fabrication stem, which reduces flow time: positioning work on a stem permits parallel processing, whereas positioning within the cell—serial processing—adds its own increments of flow time.

Exhibit 9.1. Cell configuration



*Key: Each x is an operator/workstation.
Sixteen receive and ship docks are on the perimeter*

Exhibit 9.1. Cell Configurations

For example, a single multiskilled machinist may operate three, four, five, or more machines in a U.

In high-skill work, such as machining and welding, an operator may be able to become and stay proficient in no more than about five skill sets.

A system that holds back growth of employees holds back the companies and inhibits the economic development of the resident countries.

No visibility

In his book *My American Century*, Studs Terkel includes an interview with steelworker Mike Lefevre, who says. “you can’t take pride any more...You’re mass-producing things and you never see the end result of it. I worked for a trucker one time. And I got this tiny satisfaction when I loaded a truck. At least I could see the truck depart loaded. In a steel mill, forget it. You don’t see where nothing goes.”

Strategy of Global Proportions

Generate, Simplify, Standardize, Migrate

1. Generate and manufacture new products.
2. Simplify products and processes and remove wastes and delays.
3. Standardize and document product and process.
4. Migrate production to sites offering global competitive advantage.
5. repeat steps one through four.

The full strategy is to keep bringing new products into the fold, developing and marketing them, then, as they age, sloughing them off.

The acquisition approach is an exception.

Simplify

Manufacturing processes at NWTC were greatly simplified and improved between 1995 and 2000.

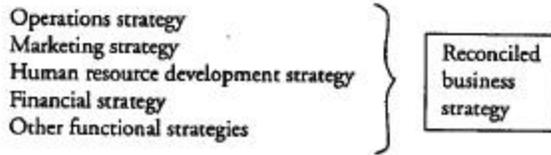
Standardize

Processes that have been simplified are that much easier to standardize

If the WCP had been in operation in, say, 1975, it would have been rare for any western manufacturer to score as many as ten points.

In 1975 the gap between best, average, and poor manufacturers was modest; today it is a Grand Canyon. Part of the gap is explained by knowledge versus lack of it; the other part is an ability to execute successfully and the lack of it.

A. Functional strategy development:



B. Integrated strategy development:

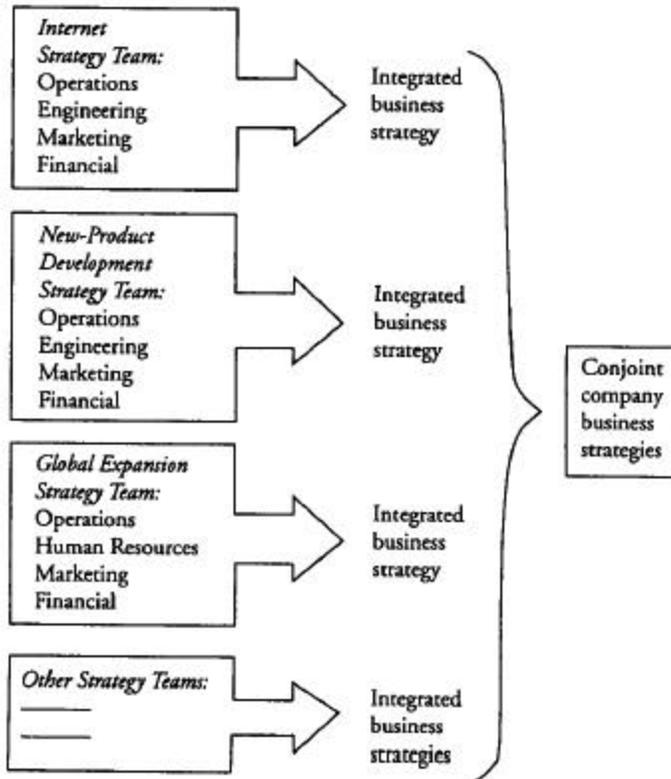


Exhibit 10.2. Functional and Integrated Strategy Development

One Person Kaizen

...”management by standing in the circle.

...standing still and watching a certain production area.

...”stand, watch, and ask why” to a selected shop-floor associate. A knotty problem area would be the target. Then the assignment goes to another operative for another situation; and so on. Many shop employees, by turns, would be given the clipboard for the same kind of assignment. What they lack is wide experience and perspective. What they do not lack is common sense, detailed knowledge of the work itself, and a personal onus to make something work.



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