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Carl Stein has been actively involved in APICS since before there was any such thing as an “APICS Body of Knowledge.” He truly represents the professionalism which is the very foundation of the society. This book is dedicated to Carl and all of the other professionals without whom APICS would not exist.
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INTEGRATED INVENTORY MANAGEMENT

— Choices —
Chapter 1

Having the Integral Strategy Choice

Company CEOs would like to be confident that just the right mix and level of inventory is consistently available to meet the needs of the business and their customers. Few feel that confident. In fact, this lack of confidence is mirrored at each level in the organization. What typically happens is that daily, weekly, and monthly snapshots of the business are used to determine the exact quantity and type of inventory to order based on information available at that point in time. However, the validity of decisions to acquire or build inventory based on these snapshots may not be known for days, weeks, or even months. The longer the forecast period relative to the firm plan horizon, the lower the confidence level.

It is this lack of confidence in inventory availability that should signal the necessity for a change in inventory strategy. Even so, companies all too often recognize that a strategy change is necessary only when forced to do so by their competitors and customers. Whether this recognition is internally or externally initiated, the rest of the process is basically one of making choices.

Two common choices related to strategies are to do little or nothing. This means sticking with the company’s existing traditional strategy. These are safe choices, since the company is already aware of the consequences. However, this may not be a responsible business choice if the company is losing market share or otherwise failing to support their customers. In this case, the more comprehensive improvements achievable with an integral strategy may be the better or only viable choice. These alternatives are outlined in Figure 1.1.

The strategy choices reviewed in this chapter build on the following set of premises:

1. Companies must understand where they are and how they got there. This involves taking a critical look at the current strategy and identifying where it is facilitating, constraining, or obstructing the improvement process.
Companies need to develop the mindset that there are no rules other than what they themselves define.

2. Companies need to develop their own operating philosophy by taking the best elements of those already proven to work in other businesses. The “Your Company Name Here” operating philosophy must be designed into, rather than edicted into, the business. This means that the strategy must be-
come integral to the business itself, not simply management's concept of how the business should operate.

3. Integration is an engineering methodology which addresses the types of initiatives, projects, and programs required of an integral strategy. Using such a methodology to develop an inventory strategy ensures that both the external and internal elements of integration are properly understood and addressed.

4. The primary premise of an integral strategy is that the necessary level of inventory is not waste. Therefore, every policy, planning, and control decision within inventory management must be made with this target level of inventory in mind.

Inventory practitioners are on the firing line every day to plan future material availability while supporting daily shortages. This role has not changed much in recent decades, though the advent of widespread computerization has certainly changed their tools. In spite of the technology changes, however, many companies still treat inventory management as a clerical function to be managed by one or a few knowledgeable individuals. Planners are expected to spend most of their time sitting in front of computer terminals making decisions using computer system tools which are fine for data management but marginal for decision support. As a consequence, many of today's planners are not provided the opportunity to obtain the hands-on knowledge of the parts, products, and processes their predecessors had. Therefore, today's companies have a greater need for inventory professionals who understand when to follow, bend, break, or ignore the rules since computers only follow programmed logic.

**Inventory Management's Mission (No Choice Here)**

Inventory levels are driven by the company's sales and marketing strategy for its product lines, an understanding of customer buying patterns, and the competitive and economic environment. These factors are all external to the inventory management department. How they are translated into inventory levels and availability is the function of the inventory strategy as translated into internal planning and control processes and procedures. This is the responsibility of the inventory manager and planners.

The goal of a traditional strategy is to have the right inventory—at the right place—at the right time. Companies often informally translate this into “having extra material on-hand in plenty of time to support changes to order quantities and priorities.” Note that this interpretation satisfies the literal translation of the goal, which says nothing about having too much, too early. Management may rationalize this interpretation in their own minds by claiming that it improves flexibility and responsiveness. In fact, it does, but at a cost of not really having a formal strategy.

As companies reduce cycle times and inventory levels, the traditional goal of
inventory management has been redefined to recognize the existence of other dimensions. An integral inventory strategy, therefore, addresses a vision of having the Target inventory—at the target time—at the target place—in the target quantity—at the target quality—in the target orientation—with Zero deviation from target.

From an absolutely practical perspective, zero-deviation performance for all parts across all dimensions all the time is impossible to achieve. This does not invalidate the vision, but simply reinforces its necessity. Without it, the result is mediocrity.

A zero-tolerance vision differs significantly from a vision which views all inventory as waste. An “all inventory is waste” vision encourages a certain amount of misdirection since no amount of effort will result in the elimination of all of a company's production inventory. Suppliers do not want a company's inventory forced onto them without adequate compensation. The fact is that any inventory which is necessary to operate the business profitably is not waste. The focus of any effective inventory strategy must, therefore, be directed not at eliminating all inventory, but at ensuring that the target level of inventory is available.

An integral strategy is based on the recognition that a given level of inventory is necessary to the effective operation of the business. This level is a function of business conditions which existed at the time the inventory was ordered and which are forecasted to exist through the duration of the stocking horizon. Ensuring that the target level of inventory is available to support the needs of the business is the mission of inventory management.

**Companies Need to Make the Right Benchmarking Choice**

Change is inevitable. Even so, companies use every tactic in the book to delay it. For companies which are slow at improving on their own, external factors often provide the catalyst. This may be losing a major customer, introducing a new technology, merging with another company, hiring a new senior manager, or moving to a new facility. Whatever the event, the natural tendency when faced with an unfamiliar change is to search the literature or use personal contacts to identify companies with a history of demonstrated business success to emulate. World class or best in the industry objectives can then be established based on performance levels achieved by these exemplar companies.

With the objectives set, management then begins the process of determining how to quickly achieve this level of performance based on their own environment and with their own products. For an inventory strategy, world class inventory turns may exceed 100 per year as demonstrated in automotive and other repetitive industries. However, this level is irrelevant in an industry characterized by lengthy job shop operations which barely achieve six turns per year. Setting some type of “best in the industry” objective is necessary in this case. Companies need to be realistic in the establishment of aggressive targets.

Setting aggressive targets is easy. Developing a strategy to achieve them is not.
One technique for shortcutting the development process is to visit the exemplar companies. This enables the company team to see first-hand what these companies are doing. Teams consisting of management, engineering, and hourly personnel demonstrate a real commitment to the improvement process.

Exemplar companies are justifiably proud of their achievements and are often eager to discuss their approach. They can be a tremendous source of information and inspiration. However, what visiting companies often fail to understand is that an approach which has proven effective in a different industry with different customers and under different business conditions may not apply to them. While the experienced exemplar company may understand this, they have no way of knowing the needs or situation of the visiting company. There is also no way to possibly convey the full magnitude of commitment or problems which the company has addressed over years of improvement efforts. In fact, they may be unwilling to honestly discuss some of the organizational or managerial problems they faced.

The improvement-minded company leaves justifiably impressed by the accomplishments of the exemplar company. What they do not leave with is a complete understanding of the magnitude of the effort ahead. The team returns to their own company and attempts to mimic what they observed. They obtain some initial successes but are surprised when the improvement program stalls. The problem is that what they observed at the exemplar companies has taken years to develop. When the company bypasses the necessary infrastructural development (organization, facilities, equipment, systems, and technologies) in order to skip right to the end result, the result is a failure. Management then gets blamed for a lack of commitment, when the problem is really one of a lack of an effective strategy.

The fact is, companies cannot find answers to their problems by looking to other companies. What they can identify in this process are choices others have made which have lead to varying levels of success. Management needs to recognize that the answer to competitiveness lies within the company itself. Benchmarking against companies in other industries provides the knowledge that at least someone is actually achieving a given level of performance under a given set of conditions. Benchmarking the company’s capabilities against their customer’s needs provides a more valuable insight into what the company really needs to do to fulfill its mission. Companies need to resist the temptation to base their strategy on achieving performance levels which seem impressive but are not necessarily relevant to their business.

**Traditional Strategies Are a Choice to Manage by Perfect Hindsight**

The need for a new strategy does not become apparent overnight. Instead, it sneaks up on an unwary company. People get so used to living with problems that they no longer recognize them as such. In fact, some individuals become convinced that fire-fighting skills are a measure of their true worth to the company.
They view any change to the status quo as a personal threat to their perception of their value to the company.

Perfect hindsight is always an effective technique for determining the need for a new strategy. With hindsight, anyone can see that part lead times have not kept pace with marketing lead times, that partial loads are increasing material handling efforts, that storage utilization is becoming increasingly inefficient, that materials are taking longer to deliver to the production line, that schedule change decisions are increasingly being made by gut feel, that inventory turns and customer service levels rarely reach their target, that when key personnel are absent no decisions are made, and so on. Perfect hindsight takes time, however, a commodity which is not in plentiful supply in a competitive environment.

The problem with the management-by-perfect-hindsight style is that choice flexibility becomes a function of the time remaining to develop and implement a new strategy. The less time there is to respond to a competitive challenge, the fewer the choices a company has with respect to the strategy. An integral strategy requires at least six months to formulate. Implementation takes years. Every month counts.

Consider the following choices which are essentially removed from the company’s control when management delays too long in formulating and implementing a strategy:

Team Choice—Strategy development and implementation requires experienced strategic planners. Such individuals may be unavailable or overworked in companies which have saved money over the years by not investing in Production and Inventory Management (P&IM) training and education. Team membership is arguably the most important decision company management makes when initiating a strategy development process. Companies should definitely consider third-party team members or facilitators who have a proven track record to jump-start the process. This introduces a noncompany point of view, while supplementing and complementing in-house resources. Having the right team is crucial to the success of the strategy.

Schedule Choice—There is always a sense of urgency with perfect hindsight since the company is reacting to the strategies of its competitors. Like most things done in a hurry, shortcuts are used. Analyses are skipped or done poorly, resulting in an inadequate justification or requirements definition. Equipment, system, technology, supplier, and other assessments are cursory or delegated to third-party consultants. Organizational issues may be ignored on the assumption that support and acceptance will be forthcoming. Initiatives that can provide a quick payback end up absorbing resources needed by long-term projects and programs. Companies need to recognize the simple fact that they did not get where they are overnight. They need time to develop and implement a strategy properly.

Philosophy Choice—Being forced to establish a new operating philosophy because of outside pressures may result in adopting the three-letter-acronym
(T.L.A.) of the day for expediency purposes. A trendy new (to the company) operating philosophy is easier and quicker to propose and accept if everyone can be convinced that the company is embarking on a leading edge strategy, while not being the pioneer. Identifying what the pioneers have done lends credibility. This can be especially compelling if the pioneers are in the same industry or have name recognition. To be most effective and relevant, however, philosophies should be apparent based on the needs of the company, not “chosen.”

Companies maximize the choices related to their inventory strategy when they develop it in anticipation of their customers’ needs and their competition’s response. This enables the inventory manager to establish a dedicated team, provide sufficient time and direction, and translate the strategy into company-specific terms which support ownership and commitment. An integral strategy then becomes a choice.

**Leaders Follow “Rules” of Their Own Choosing**

Companies that introduce new products or lines on regular intervals based on new product and process technologies recognize the danger of becoming complacent. Such companies are constantly pushing one horizon or another. They thrive on change. As leaders, they do not play by the same rules as everyone else. The fact is most people say that “rules are made to be broken,” and then they take special pains to make sure they never break any. Leaders treat rules more like guidelines. They obey, bend, or break the rules as necessary to complete their mission. Rules are for the followers.

When developing a new inventory strategy, the core team must first identify the past decisions which are now the determinants of current inventory levels and performance. These are typically the decisions which have somehow achieved an unquestioning legitimacy. They are either accepted without question or are not permitted by management to be questioned in an open forum. They are the company’s inventory-related paradigms.

There is no problem obtaining the decision history if the individual(s) who made these earlier decisions are on the team. However, one of the biggest problems a company faces is that these same individuals may be the most blind to the effect of their own past decisions. In this situation, third-party team members are invaluable in countering feelings of ownership and a lack of objectivity on the part of company team members.

Leaders make choices which support their mission, while followers tend to choose the more traditional path. Choices companies make to support a traditional strategy are identified in the following points. The choices leaders make are provided as a contrast and are then covered in more detail in the rest of the book. Consider the following inventory paradigms (commonly accepted beliefs).

Companies need an all-encompassing “name-brand” operating philosophy to provide overall direction and focus. Leaders understand that there is no such thing
as the single “canned” operating philosophy. Leaders take the principles from as many operating philosophies as are applicable to their business and blend them into an integral philosophy. The result is the “Their Company Name Here” philosophy. This involves establishing a zero-tolerance to deviation vision and selecting relevant functional area operating philosophies and related principles based on the eight areas of integration.

Inventory is waste. Leaders understand that having the right level of inventory is a necessary element of any competitive strategy. They, therefore, view inventory investment compared to target as an indicator of the company’s overall performance. The right level of inventory is not waste. The real waste is when a company focuses all of its resources on a target and then misses it because the company’s infrastructure and day-to-day operational tactics are misaligned.

The company’s strategy must be formalized; informality leads to failure. Leaders understand that any successful strategy must be integral to the business. They also understand that formality without flexibility leads to a reduction in responsiveness. Therefore, leaders use formality to define boundaries. Strategies remain informal in areas where individual initiative and creativity leading to a competitive advantage improves responsiveness and flexibility.

System and technology suppliers are no different than any other type of vendor—using detailed bid specs ensures the company of the lowest price and best system. Leaders understand that integrated system projects and ongoing programs are most successful when the company partners with suppliers using a design/build approach. Leaders know that bid specs have the effect of assigning full project risks to the company, whereas a design/build approach minimizes risks before the final design is established. Bid specs restrict the company’s involvement to development or approval of a stack of paper (i.e., the bid spec). Design/build actively involves company personnel in the actual design and implementation of the system.

Inventory systems should be implemented and used “as is” without any customization—this will force the company to (finally) conform to industry standards and simplifies MIS’s job with regard to upgrades. Leaders understand that no competitive advantage is achieved if they have the same tools as their competitors in terms of systems. They look beyond a system’s standard features and functions to determine the degree of decision support provided. Decision support is the critical system differentiator among inventory management systems, especially where thousands of decisions are made daily to support production and service part demand. Systems which constrain the planner’s ability to manage the basic inventory planning and control processes will certainly constrain the company’s ability to achieve inventory targets and vice versa.

A-item minimum dollar accuracy should be 100 percent, B-items 98 percent, and C-items 95 percent. Leaders understand that any count accuracy target less than 100 percent causes problems with order promising and scheduling decisions. They also understand that permitting any level of inaccuracy sends a message to the organization that inventory accuracy is unimportant. This is in basic conflict to the message that customer on-time shipments are of critical importance. The
key to inventory accuracy is not to cycle count more often, but to design all of the company's processes in a manner which eliminates the need to cycle count at all.

Planners must manually review and release all orders in order to maintain control. Leaders understand that repetitive orders (depending on the business) can be released without any planner action once the proper edit checks are systemized. This leaves more time to address the critical few which will most benefit from planner/buyer review. Planners make the choices; computers execute the processes related to these choices.

Forecasts will never be 100 percent accurate, so there is little to be gained by trying to make them better. Leaders understand the mathematics associated with forecasting since they take special effort to educate and train their personnel. They realize that the focus of forecasting is to minimize the deviation of forecasted from actual usage. They also understand that statistical calculations based solely on history need to be manually adjusted to reflect future conditions. Planners use the computer to crunch forecasting-related numbers; they do not totally relegate the forecasting function to the computer and blindly accept the results.

All materials should be received just in time. Leaders understand that receiving all materials just in time may be infeasible due to freight costs or logistics. Ordering and carrying costs are only two of the cost elements which must be accounted for when determining replenishment quantities. Planners take the total cost perspective.

Statistical safety stock equations indicate that it is mathematically impossible to achieve a 100 percent safety stock coverage—customers will have to be satisfied with something less. Leaders understand that there is a difference between statistical and “business” math. There is a finite level of safety stock for every part and product which will provide a 100 percent customer service level under normal business conditions. The real issue is how much investment the company is willing to make to ensure a given level of customer service.

Large complex integration projects can be implemented by the same personnel and in the same way as small focused system projects. Leaders understand that integral systems require a professional project approach unlike that used for small internally-managed projects. They also understand that mismanagement can result in hundreds of thousands of dollars of unnecessary costs. Developing and managing an integral strategy cannot be delegated to functional managers who will focus on short-term gains at the expense of long-term improvements.

Comprehensive ongoing integration programs can be successfully implemented in short phases over an extended time frame and still enable the company to achieve all of the benefits. Leaders understand that programs encompassing operational, organizational, and technological change cannot be implemented in little bits and pieces. It is impossible to get “a little bit pregnant.” Significant improvement requires a company-wide commitment and aggressive schedules.

Leaders differentiate themselves by setting more aggressive strategies than those of the next competitor and then achieving them. They know that it only takes a little effort to be better than most and a sincere commitment to be the best.
It is like the old story of the two men hiking in the mountains who get chased by a hungry bear. After a short distance, the first man stops to put on his sneakers. The second asks him why, since it is obvious that even with sneakers, neither one of them can outrun the bear. The response from the first man to the second is that he does not have to outrun the bear, just him. Leaders understand that progress is made one competitor at a time.

**The Old Traditional Strategy May No Longer be a Choice**

Traditional inventory strategies reactively focus on inventory reduction as the primary and often only performance measure. The emphasis is on the mechanics of inventory planning and control via ordering methodologies and order quantity, safety stock, and forecasting techniques. Even improvements to traditional strategies where principles of Just in Time and other philosophies are implemented often fail to fully address the factors which cause unplanned levels of inventory to exist. Strategies which focus on maintaining the status quo do not support the forward planning required to position the company for growth and change. They simply react to the current situation.

Companies have too many differences to attempt to pigeonhole something as complex as a strategy. However, there are indicators of strategies developed via traditional means which act as warning signals that the company may need a new strategy. These indicators can be used as discussion points with management when considering development of an integral strategy, since many of them are often taken for granted.

Indicators that a company with a traditional inventory strategy may need a major overhaul include the following:

- The strategy is not documented.
- There is a documented strategy which is not followed.
- Company personnel cannot describe the strategy in their own words.
- Goals are stated in terms of percent of inventory reduction per year rather than in terms of inventory levels required to support target customer service levels.
- Goals and objectives are known by management but are not communicated to the organization.
- Goals and objectives are based on annual schedules and, if not met by the end of the year, drastic actions are taken to achieve the numbers.
- Performance measures consist only of financial measures (e.g., inventory accuracy in terms of dollar, not count accuracy; inventory levels in terms of total dollars rather than quantity as compared to target, and so on).
• Less than 100 percent inventory accuracy targets send a message to the organization that it is okay for part counts to be inaccurate.

• Inventory levels react to, rather than anticipate, business changes.

• Inventory count accuracy is 60 percent while inventory dollar accuracy is ≥ 98 percent.

• Obsolete inventory is left in storage rather than allowing a scrap charge to reduce profits.

• The storage cube is inefficiently utilized.

• Production is not confident that materials will be available when required.

• Production orders regularly experience unexpected stock outs.

• Personnel are not properly educated, trained, and APICS-certified in the use of inventory planning and control methodologies and techniques.

• Computer systems are designed for data entry rather than decision support.

• Material cannot be found when the computer indicates it is available.

• Service to production must be halted to perform cycle counting.

• Problems leading to inventory inaccuracy cannot be identified and eliminated.

• There is insufficient storage for the amount of material required to operate the business.

• No one knows the relationship of storage space to business level.

• Material has one or more physical inventory tags when the next physical inventory occurs.

• The company performs an annual physical inventory.

• Different revision material is mixed and then issued to the wrong orders causing rejects and/or scrap.

• Disposable dunnage is used for parts where returnable dunnage is more cost effective.

• No one knows whether returnable or disposable dunnage is more cost effective.

• Packaging does not adequately protect materials during transport, storage, and handling.

• Orders with insufficient lead times are consistently released to suppliers.

• Order quantity variations do not mirror production variations.

• The dust on the carton weighs more than the material inside.
It would be unfair to say that an integral strategy does not have some or many of these same problems. After all, integration must begin where the company is now. Problem resolution takes time. However, an integral strategy does not permit the above conditions to continue to exist. There are two key areas which differentiate integral from traditional strategies with respect to inventory. The first is the magnitude and scope of change envisioned. The second is in how improvements are achieved.

Traditional strategies are designed to be effective in achieving incremental improvements from year to year or at least in providing the appearance of improvements. They are not really intended to initiate, facilitate, and integrate major organizational, operational, and technological changes. Rather, they support the status quo through the process of continuous (but incremental) improvement. Re-focusing the inventory-related mission-critical business processes of the company via a highly engineered integration approach is not considered within the realm of a traditional strategy. These two different focuses are contrasted in Figure 1.2.

Traditional inventory strategy goals and objectives are typically based on a percentage improvement over last year’s ending inventory value. Percentages are often in the 5–10 percent range or are set unrealistically high in order to “moti-
vate” the organization. If not met, the strategy fails. Even if achieved, however, the strategy may or may not have been executed as planned. Some companies are very adept at implementing extraordinary last-ditch efforts to achieve a particular financial inventory target. When these efforts result in achieving the desired results without actually following a strategy (or worse, by subverting the strategy), the strategy itself is ineffective.

This leads to the second differentiation (how improvements are achieved). An integral strategy sets targets as a means to an end, not as an end in and of themselves. These targets are based on the level of performance the organization is capable of achieving, given the infrastructure and operational capabilities in place to support these efforts. While it is very important to achieve target performance levels, achievement must come by working within the guidelines set for the strategy. The strategy does not fail if a particular target is not achieved on a certain date. Rather, the company fails if the strategy is circumvented to create the illusion of success. Traditional strategies set annual goals which become an ending each year. The next year requires a new beginning. Integration is ongoing since it encompasses the fundamental business processes themselves.

Traditional strategies are a reaction against existing performance levels. When the performance is not high enough, the company manipulates and adjusts single factors of performance in order to force an increase. Once this process begins, it must be continued in order to sustain the artificial gain. This creates a high-maintenance situation where the inventory manager and planners must constantly fiddle with order quantities and safety stocks in order to sustain the gains.

Integral strategies rely on operational and infrastructural improvements to achieve higher levels of performance. Integration orchestrates, as opposed to manipulates, performance.

**Problems Associated with the Traditional Strategy Choice**

Traditional inventory strategies are typically administered internally by the inventory department. This limits their effectiveness since most causes of unnecessary inventory are the result of external factors. Engineering supersedes parts, creating excess, surplus, and obsolete inventory. Service part demands can be very erratic. Customers change their buying patterns. Procuring stock to support optimistic forecasts increases average inventory levels. Any and all of these things can undo the best of plans.

Even a seemingly clear “98 percent” customer service level objective leaves loopholes. Does it mean that 98 percent of all order line items must be satisfied on time with 100 percent of the required material? Does it mean that 100 percent of the line items must be satisfied on time 98 percent of the time? Does it mean that 98 percent of the line items must be satisfied on time 98 percent of the time? Does it mean that 98 percent of the quantity ordered must be satisfied on time 100 percent of the time? Does it mean that 98 percent by dollar value of an order must be satisfied on time? Company personnel are experts at finding loopholes. The
more arbitrary the objective, the less likely there is a clear approach for achieving it. This is typically the point where formal strategies are unmasked for the unstructured informal strategies they really are.

There is a common reason why companies fail to achieve significant improvements in inventory-related performance. It is simply that many companies lack the managerial ability to create a practical path between where they are and where they need to be. This is not so difficult to understand. Strategy development and implementation requires primarily program management (application of methodologies, techniques, education, training, and experience) and project management (planning, scheduling, and control) skills. These are long-term and multi-disciplinary in nature. By comparison, daily production operations require quick response and problem-solving skills. Companies which apply quick response skills to strategies end up focusing on short-term gains. This actually creates barriers to long-term improvement.

A second reason for lack of significant improvement is management's unwillingness or inability to first reinforce the company’s infrastructure. This must be done before attempting to change how the company operates. From an inventory perspective, infrastructure refers to organization, facility and equipment, and systems and technologies. These areas encompass the necessary foundation required to launch and then sustain permanent improvement. Without a strong foundation, incremental improvements can be achieved in given areas. However, they will only be sustained as long as the company specifically focuses on them. Incremental improvements without the proper infrastructure cannot sustain themselves because they are changes to the status quo. Cycle counting is a perfect example of something that will not go away no matter how many times a part is counted. Inventory accuracy improves momentarily and then cannot be sustained because the root causes of inaccuracy are not addressed. Improvements must become the status quo as a result of permanent change.

The third reason for lack of significant improvement with a traditional strategy is failure to implement the strategy as a series of parallel activities. Improvement is not a serial process. A certain amount of progress must be made in each area of integration before benefits begin to accrue. Each successive iteration then improves upon this foundation. A serial approach results in the implementation of some portion of the necessary strategy, with the expectation that it will provide immediate benefits. What companies find is that partial efforts are often not sufficient in and of themselves to create an environment of permanent change. Even an effort such as implementation of bar codes which seems complete in and of itself is only an element of an overall inventory strategy. An unreasonable expectation of immediate improvement leads to a perception of failure in these instances. This perception then hampers improvements in other areas, creating a cascading effect which can lead to failure.

A fourth reason for lack of results when using a traditional strategy is based on a lack of focus and commitment. Companies which pursue the ever-elusive “latest acronym” philosophy fail to understand that the fundamentals for business success never really change. It is valuable to use acronyms such as Computer
Integrated M anufacturing (CIM), Total Quality Management (TQM), and Just-
in-Time (JIT) since they provide an abbreviated way to portray a wide variety of
concepts, principles, methodologies, techniques, and tactics. What must be
guarded against is the tendency to hear about a new acronym and believe that it
is a totally new and unique way of doing business.

Companies should use well-recognized acronyms to associate concepts and
principles with programs and projects within the company. This is why they were
developed and refined in the first place. The key is not to confuse the organiza-
tion with frequent changes or to create unnecessary nervousness with talk of
drastic changes. There are few real inconsistencies among the current business
philosophies found in the literature. The basics required for business success re-
main essentially unchanged. Understand what the customers need, want, and are
willing to pay for—then provide it.

INTEGRATION IS A RESPONSE TO THE
“DEATH SPIRAL” CHOICE

Integration is an engineering methodology used to develop, design, implement,
and operate integrated systems. It is based on managing or controlling cause and
effect relationships. The ability to know with a good degree of certainty that a de-
sired result will occur once a variety of conditions exist or actions are taken is a
good indication that the particular process is integrated. If implementing return-
able dunnage for a part guarantees that every unit load contains exactly 100 parts
and eliminates the possibility of inventory inaccuracy, it is fair to say that the con-
tainerization process for that part is integrated from an inventory accuracy per-
spective.

However, it is not fair to say that since the use of returnable dunnage has en-
abled the company to go from 99.5 percent to 99.99 percent inventory accuracy,
the company is somehow more integrated than it was before the use of returnable
dunnage. As a methodology, there is no integration measure per se. It does not
make sense to imply that a process is not integrated at 94.9 percent of something
but somehow becomes integrated at 95 percent. Methodologies do not have per-
formance measures.

Therefore, simply achieving some degree of improvement in results is no clear
indication that the inventory management function is integrated. How many
times has senior management set an arbitrary percentage inventory reduction
target for a year and then had it achieved through tactics that were detrimental to
the business? Delaying supplier receipts scheduled for this month into the next to
artificially increase inventory turns by reducing average inventory level hurts on-
time shipping performance. Not paying suppliers on time to improve cash
flow harms supplier relationships. Reducing safety stock levels and order quantities
to increase turns without increasing the responsiveness of suppliers and manufac-
turing hurts customer service. These are all tactics used to achieve incremental in-
ventory cost reductions in response to arbitrary objectives. Such tactics are
collectively referred to as the “death spiral” syndrome. Once begun, they must be continued or the artificial gain is lost.

All three of these tactics were used by an electronics manufacturer. Service to their two largest customers (two other divisions of their corporation) got so bad and products were of such poor quality that their own sister divisions threatened to buy from a competitor. This action would have put the electronics division out of business. The sad thing was that the death spiral tactics never resulted in any significant inventory savings. There were so many shortages that orders could not be completed by manufacturing. The partially completed orders piled up in the factory, further extending the order cycle times. Tactics which reduced raw material inventory simply increased more expensive work in process inventory. Plant personnel made good overtime pay, but even that was becoming less of a motivator as overtime became mandatory. This particular company finally did make the changes required to transition from a job shop to a repetitive manufacturer. However, it was a difficult two-year process involving moving to a new facility and three senior division manager changes.

With death spiral tactics, manufacturing, suppliers, and customers end up paying the immediate costs of inventory shortages and expediting. Those who are supposed to be helped the most by the strategy end up being hurt the most. The company pays in the long term when suppliers become less responsive and dissatisfied customers buy elsewhere. Manufacturing of course remains a captive, but unsatisfied, customer.

Integration is neither the first nor the final step in the process; it is the process. It is a fallacy to believe that no matter how a process begins, a company can somehow become integrated in the end. The goal is not to become integrated but rather to become more competitive and profitable. Integration is simply the means to an end.

**Integration-related Choices External to the Inventory Strategy**

When a company decides to make a strategy change, going “back to the basics” of production and inventory management is no longer a choice. These basics have their foundation in the 1960s and 1970s. During those periods, technology was not the driver it is today. In fact, the increased power and decreased cost of computer systems are driving the development of ERP (Enterprise Resource Planning), MES (Manufacturing Execution), WMS (Warehouse Management), and other computer-based systems. This is just the reverse with early MRPII systems which were constantly pushing the limits of computing technology. Companies are using other inventory-related technologies as well, including Radio Frequency (RF) terminals, bar coding, automated storage and handling systems, and simulation.

Because of ever increasing labor costs and the need to collapse lead times, inventory planning, storage, handling, and control systems are gradually becoming integral to the day-to-day operation of many businesses. This differs from the
past where such technology applications were more focused and companies could work around them if necessary. When integral systems are inoperative in a company, production stops. Such systems, therefore, typically incorporate redundant equipment or vehicles and support a manual backup capability in order to improve system availability.

When a company elects to implement an integral strategy, there are a number of choices to make with regard to the strategy itself. The following choices are representative of those for an integral strategy.

**Zero-Tolerance Integral Vision Choice**

An integral inventory strategy begins with development of a 5–10 year vision. Five years is typically considered as the long-term horizon for traditional strategies. This duration is based on the time to build a new facility, implement sophisticated technologies, and develop, market, and produce a new product design. What is much more difficult to accomplish and fine-tune in five years is acceptance by the organization of new philosophies, development of superior customer and supplier relationships, and permanent change in interdepartmental, intercompany, and interpersonal relationships.

The vision established for inventory management must be the corporate vision restated in inventory terms. Table 1.1 translates a zero-deviation vision into inventory terms as they relate to the eight areas of integration. As with any vision, the translation is based on an operation where everything goes “right.” Strategies then deal with the reality.

With respect to the operational areas of integration, for example, the vision is that the exact required quantity of each part will be available as required. "A s re-

<table>
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<tr>
<th>AREAS OF INTEGRATION</th>
<th>ZERO-DEVIATION INVENTORY VISION (INVENTORY AREAS OF APPLICATION)</th>
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<tbody>
<tr>
<td><strong>OPERATIONAL</strong></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Right Quantity (Order Quantity and Safety Stock)</td>
</tr>
<tr>
<td>Information</td>
<td>Right Time (Forecasting and Scheduling)</td>
</tr>
<tr>
<td>Product</td>
<td>Right Material (MPS and MRP Planning)</td>
</tr>
<tr>
<td>Process</td>
<td>Right Sequence and Orientation (Process Planning)</td>
</tr>
<tr>
<td>Quality</td>
<td>Right Quality and Accuracy (of Parts and Information)</td>
</tr>
<tr>
<td><strong>INFRASTRUCTURE</strong></td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>Right Knowledge, Skills, and Measures (Education and Training)</td>
</tr>
<tr>
<td>Facilities and</td>
<td>Right Capacities and Throughput (Layout, Storage, and Handling)</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
</tr>
<tr>
<td>Systems and</td>
<td>Right Tools (Decision Support, Material Identification, and Tracking)</td>
</tr>
<tr>
<td>Technologies</td>
<td></td>
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</tbody>
</table>
quired” means per the established Master Schedule (MS) and Material Requirements Plan (MRP) and in the right mix to support the product-related customer service target. Materials will be delivered in the required sequence and orientation to production. Any part counts and related storage, handling, and identification data will be maintained accurately and in a timely manner. All of this will be done with zero-deviation from the resource and requirements plans and established processes, procedures, and work instructions.

**Integral Target Choices**

Within inventory management, a zero-tolerance vision is translated as zero-tolerance from the target investment (inventory turns), zero-tolerance from the target required date (customer service level), and zero-tolerance from the inventory accuracy target. Other targets may be set as well for storage utilization, cycle time, cross training, and so on. Targets may apply to inventory in total, inventory by category, and inventory by part. A part will have targets related to investment level, safety stock level, forecast accuracy, storage density, ease of handling, type of identification, and so on.

Targets are determined as the result of progressively translating the company’s high level cost, quality, and responsiveness goals into inventory terms. Targets must be quantifiable. Whereas a goal addresses 100 percent inventory accuracy by count or a 100 percent customer service level, targets (also referred to as objectives) may be intermediates. At the beginning of an improvement process, the target may be to achieve a 100 percent customer service level for preferred customers in six months and a 98 percent customer service level by a specific date for all others. This may be what the company feels is achievable given the resources available and current business environment.

Any cause of deviation from target identifies a need for some type of action. This is easier to address for causes under the company’s control and more difficult for causes associated with suppliers, customers, or the environment. The amount of deviation identifies the magnitude of improvement required. Once a target is achieved and can be sustained over time with normal effort (i.e., it becomes the status quo), a more aggressive target is set.

The primary value to a company of a zero-tolerance vision with respect to inventory targets is really twofold. It (1) requires the company to quantify the targets for all inventory-related areas. Once they have been quantified, they can be checked for consistency. The associated measures then (2) inherently identify the magnitude of improvement required as the deviation from target.

With a traditional measure such as inventory accuracy, for example, no one ever really knows what the real accuracy level is. In the first place, dollar accuracy is not equivalent to count accuracy. Secondly, certain parts are permitted to be accurate to a plus or minus tolerance. The less expensive a part, the greater the likelihood that the count is inaccurate. When a zero-tolerance inventory accuracy of 98.6 percent for a part is reported against a target of 100 percent, inventory accuracy by count deviates from target by −1.4 percent. There is no need to wonder
whether the part is a B or C item and is permitted to be inaccurate by a certain percent. The count is inaccurate. The deviation is −1.4 percent.

**Integral Operating Philosophy Choices**

Operating philosophies dictate the basic principles by which the company will operate. A simple number, for example, is a principle which dictates that all order quantities will be an integer multiplier or divisor of a given shift quantity. For example, a simple number of 100 and a shift production quantity of 1,000 may result in 1,000, 500, 100, or 50 unit (pallet, cart, or tote) quantities of all materials.

The operating philosophy for an integral strategy is a composite developed specifically for the company. Given the company's corporate vision and related enterprise strategy, the "Company Name Here" operating philosophy can be established. Table 1.2 identifies representative area operating philosophies associated with the eight areas of integration. Principles from each, when taken together, form a composite integral philosophy.

Inventory management is a fourth-level strategy as shown in Figure 1.3. Therefore, the enterprise, manufacturing, and materials management strategies should ideally be developed first or concurrently. Plans, schedules, controls, methodologies, techniques, processes, procedures, and measures for bottom-up execution are then developed as appropriate at each level in the hierarchy.

There is no reason to restrict an entire company to a focused philosophy such as Computer Integrated Manufacturing or Just in Time. Each functional area has their own unique needs. A general philosophy such as world class is too general. It falls into the category of "buy low—sell high." No one can argue with it, but it has no relevancy until it is broken down into its constituent elements. This is in essence what an integral strategy does. The principles are taken from a number of

<table>
<thead>
<tr>
<th>AREAS OF INTEGRATION</th>
<th>AREA OPERATING PHILOSOPHIES</th>
<th>INTEGRAL PHILOSOPHY FOCUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPERATIONAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>JIT—Just in Time</td>
<td>Planning</td>
</tr>
<tr>
<td>Information</td>
<td>CIM—Computer Integrated Manufacturing</td>
<td>Scheduling</td>
</tr>
<tr>
<td>Product</td>
<td>CE—Concurrent Engineering</td>
<td>Designs</td>
</tr>
<tr>
<td>Process</td>
<td>SCM—Short Cycle Manufacturing</td>
<td>Processes</td>
</tr>
<tr>
<td>Quality</td>
<td>TQM—Total Quality Management</td>
<td>Requirements</td>
</tr>
<tr>
<td><strong>INFRASTRUCTURE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>IO—Integral Organization</td>
<td>Responsibility</td>
</tr>
<tr>
<td>Facilities and Equipment</td>
<td>IF—Integral Facility</td>
<td>Reliability</td>
</tr>
<tr>
<td>Systems and Technologies</td>
<td>IS—Integral Systems</td>
<td>Flexibility</td>
</tr>
</tbody>
</table>
focused philosophies and applied within the company in a manner which makes business sense.

Just in Time is certainly a relevant philosophy for inventory management in a repetitive manufacturing environment. JIT principles are applicable to other manufacturing environments as well. In fact, with its focus on eliminating the actions or inactions which cause waste, it has relevance for every area of the company. It may not make much sense to design engineering, though, to claim to have a Just in Time operating philosophy when it takes three months to engineer a product. In their case, a concurrent engineering philosophy and related methodologies and techniques have more relevance as a core philosophy.

From an integration perspective, therefore, the need is not for the perfect (off-the-shelf) operating philosophy. The need is for the perfect set of integrated operating concepts and principles. These then form the basis of an integral philosophy which binds the missions and strategies of the various functional areas and departments together.

The integral philosophy-related concepts and targets guide the development of the integral strategy. The principles guide the execution. Principles establish
guidelines for policies, which in turn govern the company's actions with respect to inventory days supply, level of automation, level of integration, layout, equipment dedication or flexibility, ordering, safety stock, forecasting, inventory accuracy, ergonomics, and so on.

Traditional inventory strategies which attempt to pigeonhole an entire inventory strategy into a non-integral philosophy end up focusing only on things over which the inventory department has control. They fail to address actions by other departments which cause excess inventory because these departments do not see the relevancy of someone else's operating philosophy to their area. Blending the key principles across operating philosophies results in a true company-wide philosophy.

**Integral Strategy Choice**

When considered within an overall strategic planning and implementation hierarchy, an integral strategy is the bridge between philosophies and methodologies as shown in Figure 1.4. Inventory management specifically focuses on policy, planning, and control methodologies and techniques as they relate to materials. An integral inventory strategy has three primary directives:

1. **Be clear and understandable.** The strategy provides a common vision and direction. The strategy plan must clearly define how the vision will be implemented in terms of policies, planning, and controls with respect to inventory management and in terms of initiatives, projects, and programs as a course of action. People in the organization must clearly understand their role, responsibilities, and level of authority. This understanding is one of the focuses of ISO 9000.

2. **Be internally integrated.** The strategy identifies how the various inventory policy, planning, and control elements will be integrated. Internal integration ensures consistency of approach and execution between and among

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**Figure 1.4** Strategic Planning and Implementation Process
parts, and within each inventory category. From a practical perspective, this means that order quantities, forecasting, and safety stocks are consistent within each part based on investment and customer service targets. Infrastructural elements such as storage and handling systems must support planned volumes and rates. Internal integration is, therefore, a highly engineered and strictly controlled process.

3. Be externally integrated. The inventory management function cannot be allowed to constrain the ability of the company to meet cost, quality, and responsiveness goals. This means that inventory management must support planning and scheduling activities by ensuring accurate part counts, by accurate and timely transaction processing, and so on. The more effectively each lower level strategy supports the higher level ones as shown in Figure 1.3, the higher the degree of external integration and ability to achieve and sustain improvements. External integration is, therefore, a managed process since many materials, information, product, process, and quality variables are outside of inventory management's direct span of control.

The key to a successful inventory strategy then, is to engineer and execute it as a formal and measurable business process. There is a lot of truth in the statement that anything which cannot be measured cannot be controlled. Management's task is to define the right measures and implement the right controls. A formalization approach formalizes and then facilitates this process.

**Integration-related Choices Internal to the Inventory Strategy**

Within a manufacturing and distribution environment, the right level and mix of inventory improves flexibility and competitiveness. In fact, for those businesses with peak cyclical demands and limited capacity, finished goods inventory may form the foundation of the sales and marketing strategies. It is not uncommon, for example, for large distribution centers to vary by as much as 30–50 percent in total dollar volume and capacity from low to peak seasons. That range may be substantially greater than manufacturing can accommodate, requiring a build-ahead manufacturing strategy to support peak sales.

Inventory can be categorized for inventory turns purposes as operational, business, and financial. Accounting categories include Raw, Work in Process (WIP), and Finished Goods (FG), and active, excess, surplus, inactive, and obsolete. Other categories include floor stock, automated, conventional, and bulk storage. Still others are stratified by dollar value as A, B, or C items. No matter how a company slices up the inventory, the level of inventory required to profitably and cost effectively operate the business is the focus of the integral strategy.

The previous section addressed making the integral strategy choice itself. This is an external aspect of the strategy process from an inventory management perspective. Once done, all of the functional areas within the business should relate to each other in a consistent manner. Each functional area then develops their
own internal integration structure based on the eight areas of integration and related operating philosophy concepts and principles. With inventory, choices in the following areas must be made.

**Inventory as an Indicator of Waste**

Rather than viewing inventory as waste in and of itself, companies must think of it as a leading or lagging indicator of waste. As a leading indicator, inventory in excess of that required to support current operations and other customer service or R&D requirements is considered waste. This is a forward-looking perspective which supports Just in Time, Short Cycle/Agile Manufacturing, and other time-based philosophies. Current operations may be measured in hours, shifts, days, or weeks, depending on the environment or part. As a lagging indicator, surplus inventory or that in excess of reasonable need which exists due to all of those conditions which can be identified through perfect hindsight is considered waste. Reasonable need is based on the environment or part and is situation dependent. Inventory may become waste, but is rarely waste to begin with.

Eliminating waste in the form of unnecessary inventory is a sound business objective. Using a qualifier such as “unnecessary” also takes an unfocused vision and targets the specific area of improvement, once “unnecessary” is defined. Since inventory levels are generally the result of actions or inactions in engineering, manufacturing, marketing, service, and other departments, or due to business conditions, the inventory strategy must be given broad latitude within a company. Departmental silos cannot be used as excuses for barriers to improvement. Integral (proactive) strategies address these areas of waste in other parts of the business by addressing the source of the problems in the departments before they adversely affect inventory levels. Traditional (reactive) strategies address unnecessary inventory after the fact, once the inventory becomes waste and is under inventory management’s control.

**Inventory Strategy Fundamentals—Methodologies and Techniques**

Methodologies are processes for arriving at solutions. They require knowledge and experience and, therefore, allow some latitude in determining the solution. Two individuals or teams using the same methodology may or may not develop the same solution or reach the same conclusion. Strategies are developed using methodologies, as are inventory targets and material plans. Methodologies use processes.

Techniques are procedures for deriving a specific answer to a set of conditions. They require skill and understanding of when to use one technique versus another. Little if any latitude in how an answer is arrived at is permitted. Two individuals or teams using the same technique should develop essentially the same solution or reach the same conclusions. Double-smoothed forecasting is a technique for projecting a future period’s forecast based on historical demand. Techniques use equations or definitive work instructions.

Methodologies are used to develop layouts, determine when to release a replenishment order, establish customer service level targets, perform analyses, and
develop project plans and schedules. Techniques are used to calculate order quantities and safety stock levels to support a specific safety stock customer service percent. Methodologies relate more to inventory policy and planning areas, whereas techniques relate more to control areas. Methodologies are used to set zero-tolerance inventory targets. Techniques are used to implement the integral strategy and measure deviation from targets. People use methodologies and techniques. Computers systemize techniques and provide data in a decision support format to support people’s use of methodologies.

Table 1.3 provides a general comparison of the inventory methodologies and techniques companies commonly use to establish and maintain inventory levels. A representative mapping to the five operational areas of integration is shown in the table as well. The methodologies and techniques are fundamental to the day-to-day operation of the business from an inventory management perspective. The areas of integration provide the relationship to the other areas of the business which affect and are affected by inventory levels.

Inventory policies set the direction for planning and control actions. Each of the operational areas of integration have policies which relate specifically to their associated performance measures. Planning methodologies enable planners to implement the strategic direction established by the inventory manager. Control techniques provide consistency of action.

**Integral Measure Choices**

The value of establishing an integral company infrastructure is that the organization is able to focus less on dealing with the constant irritations of internal con-

<table>
<thead>
<tr>
<th>OPERATIONAL AREAS OF INTEGRATION</th>
<th>POLICIES (RELATED TO PERFORMANCE)</th>
<th>PLANNING (METHODOLOGIES)</th>
<th>CONTROL (TECHNIQUES)</th>
</tr>
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<tbody>
<tr>
<td>Materials</td>
<td>Inventory Turns</td>
<td>Order Quantity</td>
<td>Time Period</td>
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<td></td>
<td></td>
<td></td>
<td>Fixed</td>
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<td></td>
<td></td>
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<td>Economic</td>
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<tr>
<td>Information</td>
<td>Customer Service</td>
<td>Safety Stock</td>
<td>Statistical</td>
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<td></td>
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<td>Fixed</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Time Period</td>
</tr>
<tr>
<td>Product</td>
<td>Storage Utilization</td>
<td>Forecasting</td>
<td>Single or Double-</td>
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<td>Smoothing</td>
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<td>Weighted Average</td>
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<tr>
<td>Process</td>
<td>Dock-to-Dock</td>
<td>Order Review</td>
<td>Material Requirements</td>
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<td></td>
<td>Cycle Time</td>
<td></td>
<td>Planning (MRP)</td>
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<td></td>
<td></td>
<td>Reorder Point (ROP)</td>
</tr>
<tr>
<td>Quality</td>
<td>Inventory Accuracy</td>
<td>Cycle Counting</td>
<td>Part Count</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$ Accuracy</td>
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</table>

Note: The Areas of Integration apply equally well to manufacturing, engineering, MIS, and so on.
straints and more on achieving the inventory strategy targets shown outside the web in Figure 1.5. When the As-Is web in the polar/snowflake diagram collapses to a dot, it indicates that the target inventory is available—at the target place, at the target time, in the target quantity, of the target quality, in the target orientation,—with zero deviation. The web can be constructed for individual parts, part categories, and total inventory. Each target has its own measure(s).

The intent is for the web to collapse. This indicates that progress is being made toward the targets. Permanent improvements have been made when the web remains collapsed over time with normal effort as part of day-to-day operations. New targets can be established at this point for the next stage of the improvement process. Note that this decision is not dependent on all factors reaching their target levels, but should occur any time a single factor of performance is consistently achieving the target. For example, the definition of the “target time” for a given part may originally be defined as one week prior to need. Over time, the definition may be tightened to one day and then two hours to reflect a dedicated milk run to a point-of-use dock as is becoming more common with In-Line Vehicle Sequencing (ILVS) in automotive assembly plants.

Figure 1.5 Inventory Strategy Measures
Managing Conflict Choices

The difficulty of using traditional approaches in an environment requiring integration is due in large part to each functional area having somewhat conflicting, yet interrelated operating philosophies, missions, and performance measures. A key element of any strategy based on integration principles, therefore, is its ability to reduce the risk of failure from both external and internal factors while facilitating the chances of success within an overall atmosphere of conflict.

A typical example is a purchasing strategy of buying in large lots to obtain the lowest piece price versus an inventory strategy of stocking in small quantities to minimize inventory investment, carrying cost, and the risk of obsolescence. The difference between these strategies is one of balancing purchase cost and customer service level with inventory investment, carrying cost, and inventory turns. These decisions address costs from direct and indirect material costs, respectively. Both strategies have the same goal of reducing costs, yet both approach it from different and potentially conflicting directions. Buyer-planners run into this difficulty frequently since they are really measured differently on both parts of their job.

If it were simply a matter of balancing price with carrying cost, the Economic Order Quantity (EOQ) equation provides a precise answer for an independent demand part. The problem is that other factors not included in the EOQ equation have a significant bearing on the decision of how much to buy (or make) and stock. Product cost and customer service level as previously mentioned are just two, while freight cost can be a significant factor in a Just in Time environment. Traditional inventory equations do not adequately account for cases where a variety of cost, quality, and responsiveness issues must be considered.

Integral strategies address these types of problems where the easy surface appeal solution does not in fact address the real issues. These are the cases where equations produce the illusion of precise answers for situations which may be imprecise at best. The integration process identifies, quantifies, correlates, and incorporates these and other key interrelationships into the decision process. This enables management to establish a complete closed loop strategy of policies and targets, the tactics required to achieve them, and the measures necessary to monitor performance. From an inventory management perspective, this involves establishing specific part-related strategies which can be managed and controlled within the inventory, material requirements planning, master scheduling, purchasing, and production activity control systems.

Choice of the Basic Integral Inventory Strategy Premise

Any inventory strategy which focuses on the elimination of inventory as an end in and of itself under the guise of Just in Time or any philosophy sets unreasonable expectations. When the inventory is not eliminated, the strategy fails. The plain and simple fact is that manufacturing companies need inventory. Integration strategies focus on the cause and effect relationships which result in unnecessary inventory. Improvement expectations are set based on the difficulty of controlling and/or managing these relationships. The focus is on multiple target
measures, with reduction in inventory investment being just one measure of overall inventory performance.

The basic premise upon which an integral inventory strategy is based is that inventory level is an indicator of company performance. Company performance is the result of the formal and informal aspects of the business strategy. Therefore, inventory which supports the business strategy and which enables target performance to be achieved is an asset, while that which does not is waste. This is not a clear-cut issue (no integration issue ever is) and cannot be treated as such. In fact, the definition of waste in a company will change over time as more of the strategy is implemented and as business conditions change.

Table 1.4 illustrates the general inventory integration structure which is followed when developing an integral inventory strategy. The areas of integration are

<table>
<thead>
<tr>
<th>AREAS OF INTEGRATION</th>
<th>REPRESENTATIVE INVENTORY INTEGRATION STRATEGY SCOPE *</th>
</tr>
</thead>
</table>
| Materials            | Inventory Management Policies (Inventory Level and Investment)  
                        | Inventory Planning Policies (Stocking, Issuing)  
                        | Inventory Control Policies (Adjustments, Count Cycle) |
| Information          | Inventory (Part, Balance, Orders, Requirements)  
                        | Inventory Analysis (Operational, Business, and Financial)  
                        | Decision Support (History and Forecasted Usage Rate) |
| Product              | Forecasting Methodologies and Techniques  
                        | Order Quantity Methodologies and Techniques  
                        | Safety Stock Methodologies and Techniques |
| Process              | Raw Material-related Processes  
                        | Work in Process Material-related Processes  
                        | Finished Goods Material-related Processes |
| Quality              | Inventory Accuracy (Customer and Production Support)  
                        | Data Accuracy (Inventory Manager and Planner Support)  
                        | Forecast Accuracy (Supplier and Production Support) |
| Organization         | Education (Methodologies and Techniques Knowledge)  
                        | Training (Equipment and Systems Skills Development)  
                        | Personal and Professional Development (Certification) |
| Facilities and Equipment | Storage Systems, Equipment, and Related Facilities  
                        | Handling Systems, Equipment, and Related Facilities  
                        | Receiving, Staging, Disposition, and Shipping Facilities |
| Systems and Technologies | Computer (ERP, MRPII, WMS, EDI, Decision Support)  
                        | Automation (AS/RS, AGVS, AEMS, Conveyor, Robotics, Robotics, palletizing)  
                        | Identification and Dispatching (Bar Code, RF) |

*Note that scope is not restricted to a single area of integration; each supports the other.
segregated into operational and infrastructure areas. Infrastructure areas provide the strong foundation required to build an integration capability. They make it possible to obtain maximum benefit from the operational areas. Operational areas encompass the key management functions which jointly enable the resources of the company to be focused upon improvement actions. At each level of the strategy development process (enterprise, manufacturing, materials management, and inventory), the areas of integration and the area operating philosophies remain the same. This ensures consistency of purpose throughout the organization.

**Summary**

An integral strategy aligns and then focuses the resources of the business. Development of the integral strategy provides management with the opportunity to set targets, schedules, and budgets in a manner consistent with the commitment and capabilities of the organization. Engineered improvements to the infrastructure ensure that the organization, facilities, equipment, systems, and technologies will not act as a constraint to improvements. This then enables the integral strategy to be implemented in the operational areas of integration related to materials, information, product, process, and quality management.

Companies intending to implement an integral strategy must understand the following:

- Incremental improvements can be achieved via traditional methods, with or without a formal strategy. Significant levels of improvement can best be achieved and sustained via the regimentation of an integral strategy based on an integration methodology.

- Inventory certification tests have correct answers. Inventory management has correct methodologies and techniques. An effective approach for one company in a given situation may not be as effective for a different type of company in a similar situation or a similar type of company in a different competitive environment. Every company and competitive environment has some degree of uniqueness. In International Standards Organization (ISO) terminology, “a process is a process except for uniqueness.”

- Complete strategies encompass both proactive and reactive elements. Proactive elements address the vision, while reactive elements address the reality.

- It is not enough to blindly use computerized ordering, forecasting, and safety stock techniques. Planners must understand the principles and mathematics upon which they are based. Only then can they be sure they are applying the right equations, variables, techniques, and methodologies. This requires a formal education and training program.

- While inventory can literally become waste overnight, the conditions which cause waste take time to develop. The strategy development, infrastructure
improvement, and operational, organizational, and technological change processes take time as well.

• Knowledgeable and skilled personnel with the right systems and technologies are required to manage, plan, and control inventories. Businesses must make a continuing investment in their personnel and tools to maintain the appropriate knowledge and skill levels.

• Good suppliers can cover many company deficiencies related to planning and scheduling. However, even the best cannot compensate for all of a company’s problems all of the time. Companies need to get their own house in order and be realistic in their expectations of their suppliers.

Managers too often adopt a caretaker role rather than risk the possibility of failure associated with a change to the status quo. Leaders do not view themselves as caretakers. They certainly do not view the status quo as something to be maintained. Leaders recognize that change is required, that change is within their control, and that there is no compelling business reasons to delay. Then they go out and do what needs to be done. Management needs to identify and develop leaders within their own company. Developing and implementing an integral strategy is one way to do this.