TECHNOLOGY STRATEGIES
Change is not smooth, nor seamless. Technological advances provide a challenge for manufacturers, in that they have to balance current investment decisions with information about what may happen in the future to the technology they are purchasing. Will a decision to invest thousands of dollars in hardware be proved right, or will incompatible, but essential, software come onto the market that will necessitate further investment in yet more hardware?

The argument put forward by Bradford L. Goldense of Goldense Group, Inc., a specialist in manufacturing and materials, is that the only viable long-term solution is to integrate the engineering and manufacturing processes, thus bringing down the barriers that currently exist in so many manufacturing firms.

He contends that concurrent engineering (CE) and computer-integrated-manufacturing (CIM) initiatives should be tackled together right from the beginning. The results of such an integrated approach will be to reduce time-to-market of manufactured products and thus bring benefits throughout the organization.

Concurrent engineering is also known as simultaneous engineering and defines a systematic, simultaneous approach to accomplishing the engineering activities associated with the development of a product. Many companies are now contemplating CE concepts and practices, and several have instigated prototype projects. But few companies have products or product lines that were developed using CE techniques and tools. Not surprisingly, perhaps, most companies still use a traditional approach to engineering.

Computer-integrated-manufacturing is at a more advanced stage than CE on the factory floor, although it has still got a long way to go before a company as a whole adapts CIM as a way of operating. Although CIM is a fairly self-explanatory concept, it is all too easy to confuse real integration with mere interfacing. And true integration is still a long way off, even in the more advanced manufacturing organizations.

This is good news, however. The fact that both processes are still immature means that their integration can be contemplated without massive dislocation and reinvestment.
Key to the future of the manufacturing industry is information and its use and dissemination. The success of both CE and CIM and their integration is impossible to contemplate without the efficient and shared use of information. Similarly, significant improvements in time-to-market are unlikely without a more integrated approach to the whole design and manufacturing process, as outlined in Figure 1. The benefits of an integrated approach include:

- the cost, quality and time spent at the prototype design phase will be reduced or even eliminated;
- the closer linkages between engineering and manufacturing will improve the ability of both to function effectively;
- knowledge acquired in manufacturing, servicing and support functions will be assessed and used to greater effect earlier on in the design phase;
- a decrease in time-to-market, as the whole engineering and manufacturing process assumes less the nature of a series of steps and more the look two integrated steps carrying the weight of the project collectively, as is illustrated in Figure 2:
- quality will be improved as information is shared and improvements implemented more quickly; and
- reputation, competitive position and self-esteem will be enhanced as time-to-market and quality improve.

![Figure 1. Concurrent Engineering: Current Situation and Future Goals](image)

![Figure 2. Relationship: CE and CIM](image)
As Bradford L. Goldense observes, although the potential to increase time-to-market is considerable, few companies have been able to proceed very far along the road to CE and CIM integration. The reason for this is that for true integration to take place a number of factors have to be in place, and many of these factors are still in the process of development.

In his research he concentrates on development in technology and data analysis, and their impact on time-to-market, acknowledging that it is often the organization and management process, i.e. the human element, which is the most difficult to address.

Technology resources within an organization should, on the one hand, be distributed so as to put the right tools in the hands of the users, and, on the other hand, be centralized. The centralized components of the technology architecture allow the organization to achieve leverage across departments and across the company.

Clearly, putting the right tools in the right hands makes for increased efficiency, while centralizing certain required elements of information allows management to make informed strategic decisions about the future shape of the company.

So, how is time-to-market reduced by advances in technology and data management?

- Improved data exchange will allow engineering departments to understand the capabilities of the manufacturing department better, thus making sure that a product is of a consistently high quality.

- A major advance that would reduce time-to-market would be a set of applications that generate in a common and standard form, so that engineering information could be fed forward and manufacturing information backwards without necessitating data re-engineering, which is both costly and time-consuming and information-inefficient.

- Spatial integration is a concept that is still at the prototype stage, but one that promises to reduce time-to-market considerably. Spatial integration maintains a 3-D model of a product and each of its sections and sub-sections. Any changes made are automatically forwarded on to all the relevant workstations.

Yet another development would pinpoint any potential problems that could be resolved on screen rather than on the factory floor, thus decreasing time-to-market and reducing development costs.

Goldense has twitched aside the curtain to take a glimpse into the future to see how the integration of the engineering and manufacturing functions will cut the time spent on product development and manufacture and thus time-to-market. Clearly, an integrated approach is required with information readily shared by all those who need access to it.

There are many obstacles to the achievement of this ideal state of integration and the two that have to be seriously taken into account are the investment required and the readiness of those involved to integrate their empires. Those companies prepared to integrate will benefit by speeding up all their processes, thus getting products to markets that much quicker than their competitors.