THE STATE OF MANUFACTURING EDUCATION IN THE UNITED STATES

Mike Ashapa, President, American Production and Inventory Control Society

The title of this article specifically addresses manufacturing education in the United States. I would suspect that the points made and the conditions described might well apply in most industrialized countries with the possible exception of Japan. There are four areas that require discussion when talking about manufacturing education; first we must address the technology and its evolvement; second, the educational materials that are available and the methods of delivery; third, the hardware and software currently being offered; and fourth, the atmosphere or environment in which manufacturing education is presented.

TECHNOLOGY

The profession of production and inventory management has evolved hand in hand with the technology that it utilizes. In the profession's earliest days, scientific inventory management was the prevalent doctrine. Order points were calculated using every imaginable mathematical formula. Even today, technical articles on calculus based formulae appear in a wide variety of professional and technical journals. One has to wonder where the average manufacturing company will ever find enough PhD's to make such mathematical complexities work in their firms. Order point thinking was then followed by enthrallment with lot sizing. Introduction of computers into manufacturing gave the order point and lot sizing devotees the opportunity to try all kinds of modifiers, specialized formulae, and lead time compressors and expanders. The computer gave the profession the opportunity to crunch massive amounts of data, hence the development of Material Requirements Planning (MRP) and the birth of the so-called formal system. The demands for managerial commitment to enable the MRP based formal system to properly function evolved into what is now known as MRP II. The enhancement of computer based systems led us to Computer Integrated Manufacturing. While all this has been going on, our friends in the Far East have seen their fortunes rise on the philosophy of Just-in-Time. The technological challenge of today is to properly wield the technologies of the computer based information age with the unquestionable successes of the Just-in-Time philosophies and the principles of Constraint theory. It may be safely concluded that the technological base for manufacturing education is quite up to date and well documented for the lay professional to utilize .

EDUCATIONAL MATERIALS AND DELIVERY

The body of knowledge developed by APICS and supplemented by its sister world wide societies is the recognised repository for the documentation of the theories, techniques and philosophies that apply to production and inventory management. There are gaps in that body of knowledge, however, they are relatively few. Most important, the means of identifying those gaps is available and in use. There is major concentrationion on filling voids that may exist in the leading edge areas. APICS has assembled a wide variety of materials and delivery systems for use at every educational level. All one has to do is quickly thumb through the APICS Source Book to get a feel for the extensive offerings available to the manufacturing communities of all nations. In it one will find the Dictionary, the Bibliography, the Dow-Jones Library, video education, home study courses, and an endless listing of books, training aids, courses and publications. The Society makes a complete speakers roster available. The Certification programme accompanied by its review courses is one of the most comprehensive self testing programs offered by any profession. The written materials are supplemented by a complete offering of programs that range from the International Conference and Technical Exhibit to the wide ranging classes and seminars sponsored by the individual chapters. The latest addition to the APICS educational effort is the Training Center for Manufacturing Excellence located in Wilmerding, PA.

HARDWARE AND SOFTWARE

In today's modern world, software packages of any and every type are readily available for just about any kind of manufacturing or inventory keeping environment. Compared to pricing of ten years ago, these packages are relatively inexpensive and do not require enormous staffs to implement. Industry and process specific packages may be purchased off the shelf. The machines we use are user friendly meaning that a genius level of understanding of data processing is no longer required by the average user. Of course, quality does vary from package to package as do the functions performed. The point to be made is, with the level of education available, anyone can make even the worst of packages work.

The hardware situation is just as good. Third and fourth generation equipment and programming languages are flourishing. Mainframe systems complete with interactive terminals may be purchased for under $400,000. The intelligence and speed of these machines goes beyond one's wildest imaginations. We are now capable of running MRP systems at our desks utilizing personal computers equal in size to a typewriter. State of the art computing is within reach of everyone. There is no doubt that the age of the computer is available to whomever chooses to be a part of it.

ATMOSPHERE FOR EDUCATION

If everything is so great, then why do we have so many problems? It is because, in spite of the quality of equipment, technology, and delivery systems, the atmosphere or environment in which we attempt to utilize these high quality tools is, unfortunately, not of the same quality.

To understand why this is so, we must understand the perspective from which the need for proper manufacturing education is viewed. The standard western approach to any manufacturing system is to purchase the hardware and software, and then, after it has arrived, begin considering how to educate and train people. It is the same as the "buy now-pay later" approach, only we can call it the "buy now-educate later" approach. Too often, we fail to understand the difference between education and training. Education is the teaching of basic principles and fundamentals; training is the learning of how to put the principles into practice, usually quite system specific. The primary cause for manufacturing systems failures is due to the failure of upper management to recognise the need for sound, well planned educational programmes for their employees at all levels.

Just consider the customary approach taken by most consultants in their dealings with their clients. They first conduct a survey in great detail and depth which is soon followed by a quite lengthy report. A request for quotation is sent out to

several vendors which include hundreds of questions based on the needs identified in the previously completed detailed report. Once the vendors submit their responses, an extensive review is made of all the proposals and a decision is finally made to procure a certain software and/or hardware package. Only after all this is completed does the word education enter the picture. Now, I earn my daily wage as a consultant, and heretical as it may sound, I think this approach is craziness!

I propose that the education, the teaching of the basic principles, be undertaken before the survey is conducted! By doing this, far more people within the company will really be able to make an honest evaluation of themselves and make real contributions to the definition of the company's systems needs. The content and value of the request for quotation will treble. When the package arrives on the scene, the next step would be to conduct an extensive training programme, putting principles into action, learning how the specific system works.

Oliver W. Wight, one of the great contributors to our profession, liked to use a character named Stanley to illustrate the failures of the informal system. One of Stanley's most well known lines was, "If its on the stick, its in the tank!" Meaning of course, if you can physically see the material, why trust the inventory records. It is said that when Stanley retired, it took four people to replace him and what he carried in his head. Stanley definitely was THE character for the sixties and seventies.

Let me now introduce to you the character for the eighties. This gentleman is known as Sydney, and he is one of the four people that replaced Stanley. Sydney was the Champion! Sydney is the individual who was able to convince the top management of his company to invest in a new system, the new computer, the consultant, the education and training. Sydney chaired the implementation team. He prepared the user manuals; he taught the classes. Sydney was a success; his consultant even told him so; he was ordained as "Class A" and had a plaque on his office wall that proclaimed that fact.

Our friend Sydney began noting some problems with his system after some two years of operation. Little things began to go wrong and his "Class A" rapidly slipped to "Class B". His investigation of the problem revealed that several personnel changes had occurred, stock-room clerks had left or been promoted, some planners had moved up or out. The second and third generation users of the system had not been given the quality education and training that had been given to the original users. Sydney recognised what had happened and immediately prepared a proposal for top management requesting funds for an on going training programme to teach newcomers how to use the system and to keep the older users sharp. After sinking several million into this project two years ago, management in its infinite wisdom told Sydney, "You wrote the book on this, you solve the problem. No funds will be made available." Hamstrung from a lack of funds, Sydney did what he could to save the system but he could not do enough to stop further erosion. In utter frustration, he resigned his position and went the way of most frustrated champions; he became a consultant.

INDICATORS OF A POOR EDUCATIONAL ENVIRONMENT

The situation that our friend Sydney faced is by no means unique. Tough situations occur in our manufacturing environment every day. Drs. John Burnham and Robert Bell, in their recent writings, list comments they've heard on the factory floor about change and education. "It won't work here!" "Accounting will never let us do it that way." "The union will never hear of this." "Performance measurements will kill us if we do these things." "Our consultant doesn't have enough hand-on manufacturing experience!" "Does management really understand what this implies?" "This will kill our capital spending plans." "We can't count on our suppliers to do that." "Marketing couldn't forecast if our line had only one product." "Engineering changes won't allow this." "How can we deal with THEIR mindset?

"Management has no understanding or appreciation of manufacturing?" "They'll never tolerate that much disruption."

The list goes on and on. The point that is being made by Bell and Burnham is that such statements or conditions are symptoms of resistance. Old points of view and behavior must be over come and replaced with new thinking. Traditions, the most difficult of all thought processes, must give way. Existing assumptions and thinking must be questioned and doubted. Emotions and the intellect of defensiveness have to be opened up for reshaping. When the structure, power centers, and cultures of an organization or company is unfrozen, then change and education may take place. This point is driven home repeatedly in Bell and Burnham writings.

Education and change face additional barriers that must be dealt with before even a glimmer of hope may be realized. The temptation to adopt a new technique or philosophy must be replaced with the concept of studying the new and t[illegible] adapting it to the new environment. The attempts to adopt the Japanese methods and philosophies lock, stock and barrel are classic examples of adoption versus adaptation. Our hurry up, rush it through without missing a beat environment doesn't allow us to take the time to cut and fit to our own specific needs.

The old adage "Do as I say, not as I do" continues to be dreadfully over used by senior managers. There is a clear and distinct credibility gap between our upper and middle management levels when, despite saying the right words about management education, senior managers seem to ignore the requirement that they participate vigorously and visibly in such programs themselves. Not only must they say the right things, they must start to do the right things.

Our Far Eastern competitors tell us, our academics tell us, our consultants tell us, even we tell ourselves, that Western industry is too hung up on short term perspectives. We continue to tell ourselves that we've got to invest in our futures while at the same time we pursue the unrealistic goals of sho[illegible] term profitability. Our stockholders love us today with [illegible] dividends, but will they love us when there are no more tomorrows? What does this have to do with education you may ask? Education is just as much an investment as is the investment in new plant and equipment.

The advent of the consultant comes with mixed blessings. While it is extremely beneficial to most corporations to have an experienced professional upon whom they may call to verify there thoughts on a particular subject, there is a growing tendency to become so dependent upon the consultant that internal thinking and creativity ceases to exist at any measurable level. Every one waits and looks forward to the day that So and So is due in for his or her monthly visit. Nothing can be more stifling to progress than this.

There is not a one of us that has not seen the game played where a story is told to a single person who in turn repeats the story to another person, etc., until finally the last person to whom the story is told is asked to tell the story to the entire group. Everyone revels in laughter as the final version of the story, which bears little semblance to the original telling, is told. Funny stuff isn 't it; but, certainly, not funny at all when it applies to real life communications in a manufacturing organization where it is exactly what happens! Unless steps are taken to guarantee integrated communications within the

organization from level to level, the real meaning of any idea, message or directive gets lost and twisted to the point of being utterly ridiculous.

The last barrier to change and education to be discussed here is the "Quick Fix-No Mistakes Allowed Syndrome." Simply stated, we do the temporary fix because we haven't the time to put into the long-term, painstakingly difficult and expensive permanent solution to a problem. And by the way, don't mess this up because if you do, you won't be around to screw anything else up! At the rate we are going, it will always be safer to do nothing than to stick your neck out and take a chance at making a mistake.

THE RIGHT ATMOSPHERE

The right atmosphere for education will concentrate its efforts on people. When the barriers are torn down and the new culture is created, it will be based on philosophical changes that consider human resources. The new thinking will go past the concepts of machinery and money. We will finally recognise that in our quest for technological advance, we have overlooked the single greatest resource, people. People will be cultivated with two essentials, education and re-education, [illegible] training and re-training. The essence of knowledge of principles and disciplines will dominate.

An environment based on commitment to an educational culture much like that in Japan will have to develop. The Japanese have committed themselves to a very simple tenet, make the most of the least, and make the least smaller and the most greater.

Managers in the United States must begin to cause cultural change. They must learn to stick with the new ideas and see them through to their ends over time. They will have to rely on educating for the long term. They will have to retain the responsibility for education at the top levels of the management structure rather than relegating this most important responsibility to middle managers as they have so often done in the past. Managers must finally come to the realization that the people that work for them have the capability and the desire to change. People at all levels have ideas that are good. It is time we took this to heart, get some real religion, and practice it at every level of the organization. This means that [illegible]nufacturing leadership must reflect the new philosophies in their daily behavior for all to see; they must show a demonstrated involvement in the education process; and they must assume the total responsibility for education.

Doing all this will bring about the creation of the educational culture. Education in such a culture will be viewed as a long term, management directed activity. Education will be developed and maintained as an ongoing part of the corporate investment programme. Without question, people will be viewed as an asset. This asset as opposed to those found on a balance sheet will continue to appreciate not depreciate. Education will be the preventative maintenance programme for these assets.

CREATING THE RIGHT ATMOSPHERE

Creating the right atmosphere for education first requires a champion. This is an absolute essential ingredient. The second ingredient requires that the top man has certain expectations of his direct subordinates, the company's most senior managers and leaders. They must be expected to understand the philosophies which underlie the efforts being taken. They must understand the principles that constitute the body of knowledge within the subject area being addressed. Finally, they must learn through personal experimentation.

There are two approaches to educating top managers, at the top, from the top, or at the top, from below, the former being the obvious preferred choice. When the champion has the ear of the top man, the ideal condition exists. The champion assists number one in developing a good understanding of the project, its problems and its educational needs. He will steer the man and his staff toward the right books and materials for their reading. He will convince number one that his staff receive the initial exposure as the implementation team. At this point, it should be relatively easy to get number one and his team to visit sites of successful implementations and to keep them involved in the project. The senior managers will willingly become the positive reinforcers of the new system. With the right coaching, these company leaders may even establish a formal visioning process for themselves and their subordinates.

Not all champions have the luxury of the scenario described above. Some really do! Attacking the challenge of educating at the top from below requires a more oblique approach. Some might even call it sneaky. Number one must be selectively presented with success stories of similar companies. The best opportunity is to have a competitor who has had systems successes.

Capitalize on this by comparing your company to the successful competition. Constantly prod the man with suggestions to visit sites where successes have been achieved. When he finally makes that visit, be sure that he and his staff conduct a thorough debriefing of what they saw and observed. Make absolutely sure that they have no unanswered questions and that they relate what they saw and heard to there own situations. Always emphasize to them the cost of failure or the cost of inaction. Nothing is ever any more important than the impact on their collective pocketbook.

There are no great secrets to making things change. Most of what must be done to create the educational culture is already known to us. We cannot in the United States rely on the passage of laws to solve our dilemma, people will do that. Many of our laws have gotten us to the point that we are at. The Japanese have learned the importance of cooperation. What the Japanese are doing is called collusion in the USA and is prohibited by a series of laws passed in the twenties and thirties. Politics is not the answer either. It is a regaining of the pride that brought us to greatness in the first place that will do it again if we have the fortitude and will to be proud again.

We must regain our leadership role through education. There is after all, a reason behind everything that we do. Henry Ford's model "T" car was of the early great success stories of American industry . The story went, you can get a Ford in any colour you want as long as it is black. Mr. Ford had a very good reason for painting all his cars black, and it had nothing to do with restricting the options as so many people thought. His reason for using black paint was really quite simple; black paint dries two hours faster than any other colour! Look how far you can get when you know just a little more than the other guy.

About the Author

Mike Ashapa is a Vice-President of GA Landis Associates and has over 25 years of experience in manufacturing and materials management, both as a consultant and as a practitioner.

He is currently coming to the end of his second term as President of the American Production and Inventory Society (APICS) and is also Chairman of its Board of Directors. He is a frequent speaker at various chapter functions and he completed his APICS certification in 1981.