



Perspectives on Material Handling Practice

Papers in the Perspectives series have appeared in conference proceedings of the Material Handling Institute between 1992 and the present. As such they provide a point of reference as to how the industry is changing as well as insight into accepted practice during this period. In many cases the authors credited have either changed jobs or are no longer in the industry. Some companies as well have been the subject of mergers or reorganization with a new corporate identity.

MANAGING & IMPLEMENTING SUCCESSFUL AUTOMATED MATERIAL HANDLING PROJECTS

CHUCK GATES, CATERPILLAR
BOB TITZER, SARA LEE KNIT PRODUCTS
HOWARD ZOLLINGER, ZOLLINGER ASSOCIATES

SYNOPSIS

This paper will discuss the advantages to the approach and the design and implementation of an automated system solution in a collaborative process we call Design/Build. This process transcends the traditional customer/vendor arms length relationship, and its set of defined roles and limited communication, with a process that clearly makes the creation and implementation of an optimal solution to the user's problem its primary objective. Design/Build treats all of the contributors to the solution as partners who openly share all information that is relevant to the problem. Like a trusted consultant, Design/Build team members share confidential and proprietary information useful to achievement of the common goal.

It also addresses a developing dimension to partnership that we call Productive Partnerships - the inclusion of the material handling consultant as a full participant in the collaborative process. Consultants contribute to the search for better ways to advance American Industries' competitive positions in their increasingly global markets.

Our objective in today's panel discussion is to provide an objective overview of collaborative partnerships composed of the client, integrator and consultant as an effective approach to Automated Material Handling System integration. Frank comments from the panel will convey all aspects of this partnership approach. The collaborative process presented is a multi-phased system development teaming process that includes requirements definition, detailed system design, implementation, system maintenance and ongoing system support. This process provides procedures and tools to ensure achievement of all defined project objectives. The process yields these advantages:

- Optimal System Design
- Reduced System Risk
- Reduced Total System Cost
- Increased Return on Capital Investment



PRODUCTIVE PARTNERSHIPS - Howard Zollinger, P.E.

Better ways of designing and contracting major material handling systems must be found and followed to advance your competitive position, domestic or world wide, or to adapt to business changes. These changes might involve adding capacity, right sizing (down sizing) or major product line changes. These methods must be results-oriented, able to maintain ongoing operations and be implemented in shorter and shorter time periods.

One method working well for some small and large industry leaders is called Productive Partnerships. Simply stated, it is a partnership made up by a User, a consultant and an Integrated System Supplier. The Users have been very satisfied, meeting their goals and objectives sooner and obtaining better performance than with other more conventional methods.

A few Users have made the partnership into an ongoing team and have implemented multiple projects. One of the examples discussed in the following papers is an example of an ongoing Productive Partnership.

Experience has shown that customer-oriented system solutions have come from these Productive Partnerships. Some of the reasons for this are discussed later.

WHY AND HOW TO CHANGE YOUR PARADIGMS

What is working successfully now is very important. Building on success is comfortable and works most of the time. But, watch out. Remember the Swiss watch makers that developed the "watch on a chip" and didn't even patent it because it didn't fit into their currently successful manufacturing and marketing model? The Swiss share of the market world market went from 94% to 165 in two years when the Japanese and Texas Instruments introduced the electronic watch. The paradigm changed and set everyone else to zero.

One way to avoid this is to keep an open mind (clean the slate). This means when a new idea comes along test it by walking it through your business or process. Surprise! It works; or, because the idea was heard, someone else improved on it and progress was achieved. Beware of anyone saying "we don't do it that way". The innovator who comes up with the idea probably knows that, which is why he or she was trying to brake the Paradigm.

Another way is to recognize your cancer. This is an expression I use for awareness. Just as in our bodies, early detection gives a greater chance of a cure. The method is to look on Friday afternoon of a hectic week: what was little thing that didn't go right or that is reoccurring and causing poor quality or poor production or bad accuracy? After lunch is important; don't wait until quitting time, because late afternoon is time needed to fulfill the promises we made. Why Friday? The details are very clear, where as by Monday most of the detail could be lost.

Another test: is there a lack of conflict in the organization? It may be the people at the top who won't accept new ideas, which breeds cancer. Or, looking into the mirror, are you the one unwilling to change.

FINDING PRODUCTIVE PARTNERS

After reading the ideas in this paper, call some companies that have tried the approach. The two organizations presented in the next papers are good candidates, but there are many others whose opinions will give your management team more confidence in the method. But for some of you calling may not be necessary.

Once the method is accepted, the following has been found as a sound way to proceed. From the users you have talked with you can learn whom they considered for Consultant and System Integrator. Also through the Material Handling Industry of America office in Charlotte, North Carolina, you can obtain lists of Consultants and Integrator/Suppliers. Another source is the Trade Press who publishes lists once per year.

After gathering the list, screen the two skills independently. This provides the best chance of selecting someone whom best suits your needs and your culture. To obtain the required compatibility, you might want a progressive consultant and a conservative Integrator/Supplier or vice versa.



After narrowing each of the two lists down to two, three or four, it is best to talk with or visit one of their customers. The largest your project, the more important are the visits.

Then, when the potential candidates are narrowed to one or two each is the time to find who is going to work best together. Their skills must be compatible and complementary.

Now it's decision time. The User's team needs to meet and select your two partners. Once that is done "The Team" needs to be established and organized. Who will lead? If the User has the right person and he has the time, he should be the overall project manager. If not, the Integrated System Supplier should be appointed to lead. Whoever leads, it is most vital that the team be "one".

The combination of a Conservative Consultant and a progressive System Integrator or an advanced concept Consultant and a conservative System Integrator can lead to a progressive and workable solution. With a productive partnership, the User gains the benefit of either combination; and by the team interaction, the User's inputs guide the solution toward what he feels will be workable and manageable.

If he chooses, the User has the consultant to bounce-off other ideas before bringing them to the entire team. The User has the Integrated System Supplier to bounce-off other ideas such as an implementation idea that may affect his on-going operation. The skills are thus recognized of each team member which gives the one-on-one and then later at normal team meetings, thus maximizing the benefits of group participation.

The Japanese have used this continuous improvement methodology very well to gain yearly improvement. With this Partnership, the same technique can be used during the initial project or after beneficial use. This is one of the keys to obtaining a workable system..

Continually bench-marking the ideas and weighing them with a team weighing and ranking analysis, the best benefit/cost solution will evolve. Their benefits are still judgments, but the best to weigh and identify are the select team members.

Manageability of a system is a dimension critical to success. We all need to stretch at times, but to move from a manual system to advanced automation may be too much for some organizations. A User with a current mechanized system moving to more automation is a more manageable step.

Larger steps can be accomplished, but training is important to all projects. With larger steps, training will require a larger order of magnitude.

The best partnerships create ownership and ownership is an important ingredient to getting the best solution. When you work it is your system, everyone strives harder to make it work. This ingredient is one key to making advances work.

All three parties have a vested interest in the ownership. As stated the Users is a working system. For the Consultant or the system Integrator, the working reference the best source for other business. Other business can come from another company or providing a chance for an ongoing relationship for the same company in a reengineering or continuous improvement status.

One of the shortcomings of the older "Turnkey System" contracting methods was the lack of User knowledge when the "Key" was turned over to him. That method is 20 or 30 years old. It was where Users either had a consultant or their own staff write specs and obtain bids for the entire system, with the supplier making almost all of the operating decisions. The customer believed he would be delivered a working system that from day one he could run. Of course there was maintenance training. He was delivered a system nearly ready to run, but not reliable as systems are today.

Later some industry Users tried to be their own system integrator so that they would have intimate knowledge of the system. Only later did they discover that they didn't have the integration and project management skills, and the projects usually were very late and provided poor performance.



Productive Partnerships is the right method to correct these very serious shortfalls. The user knows his operation and the partners are strong in the needed skills and can suggest better method of operation for the User to decide upon. There is a continuous dialog, and all of the operational, management, maintenance, training and information issues are worked on ahead of time.

CONSIDERATIONS

Current upper management in many companies has entrenched a Paradigm that says when a supplier is pre-selected, the results achieved by the user will be only what the supplier wants to provide, and costs will be very high. This may have been, but this is one Paradigm that a number of progressive companies' management has changed to their benefit.

To help others change some of their Paradigms; here are some ideas for your consideration.

Objectivity - One of the two considerations most often raised by upper management is objectivity. The other is non-competitive pricing. First, objectivity. There are professionals in the materials handling industry. One characteristic or trademark is their objectivity. These can be consultant or integrated systems suppliers.

Think for a minute that when building, a factory or distribution center, most companies don't have these concerns when they hire an architect. Why? They know they need the service and believe architects are professionals and are fair. The user feels he gets value for the cost.

It's now time for this to carry into the "architects of the materials handling field". The vast majority of material handling consultants and system integrators/suppliers are professionals. These are the ones to consider for your Productivity Partners.

Creativity - One other consideration of belief by a few of the old paradigm management is that the more companies bidding the more good ideas. This takes an extremely talented User project team to get really good ideas relative to the time spent. In today's business conditions, for large systems, if the good suppliers know their ideas will be reissued in a revised bidding cycle, they may not quote or bid only what is specified at the cheapest way to win the job. Then they feel they have every right to collect a very large premium for each change. Many of these jobs are the ones that wind up not working well because the original design wasn't improved as the project was implemented.

Continuous improvements have been proven to be a key factor to obtaining the most workable system. Productive Partnerships provide the easy and cost effective way of doing this. With a well-designed workable system it is easily improved year after year.

Competitive Pricing - Consultants offer a service and, as a partner, can be chosen for their expertise and their daily or hourly rate. The old expression, "You get what you pay for" can be very true. The overall project cost has a very content for the consultant. Whether this rate is \$100 or \$150 per hour won't effect the feasibility of the project if he comes with one little cost saving idea, let alone two or three big ideas.

The Integrated System/Supplier bring many skills that assure the benefits planned are on time and within budget. The fact that three to nine months can be saved by the Productive Partnership method is more savings than a fair price and profit for the System Integrator. Most Integrated System Suppliers do not have all the products and services needed so they are sub-contracted. The more standard items like buildings, racks, electrical wiring and etc. will be competitively bid after definition. The total price is the key factor here considering ROI, return-on-investment, and beneficial use.



LOOKS AT SUCCESS

Apple Computer

Apple computer, Europe is a single operation center in Apledoorn, The Netherlands that was conceived and built to use the economy of scale by closing 17 country-specific warehouses. It receives production from four Apple factories worldwide and many sub-contracted suppliers. It ships about 40-truck load a day to all the original 17 countries and handles all spare parts.

The project team was Apple Computer, Vanderlande Industries (VI) as system integrator/supplier and Zollinger Associates as consultants. The building as separate Apple contracts with VI coordination and provides a multiple floor office building. It's more than a warehouse because Apple brings in generic computers, printer, etc. and makes them suitable for all the countries.

Nike Europe

Nike Europe has built two New Distribution Centers near Brussels, Belgium. One is for apparel and the other is footwear. These two centers are permitting a single location to take the place of near 20 country warehouses. The key operating objectives for the concept design included high capacity, 100% accuracy; rapid response and the ability to perform value added processing.

The Consultant was Touche Ross of England for the strategy, business definition and system concepting. The Integrating System Supplier was Vanderlande Industries of The Netherlands for the storage and materials handling system including the computer control function. The Productive Partnership arrangement permitted opening the DC 12 months after the contract award.

SELECTING AND MANAGING A "BEST IN CLASS" DESIGN BUILD PARTNER - **Bob Titzer, Sara Lee Knit Products**

INTRODUCTION

There are many different methods one can use in designing and procuring material handling systems, whether they are large or small. I will be discussing my philosophy and the methods I have used to design and install several very large, complex, integrated material handling systems in the past couple of years.

SARA LEE KNIT PRODUCTS

Sara Lee Knit Products is part of the Personal Products group of Sara Lee Corporation. Our major consumer brand names are Hanes, Champion, Stedman and Pannill.

In the past four years, Sara Lee Knit Products has built three new plants and spent over \$32,000,000 on automated material handling systems. These include AS/RS's, AGV's, AEM's, robots, conveyors, and highly specialized systems. We have purchased these systems from the U.S., Japan, Italy, Germany and Holland. System suppliers have included Harnischfeger Engineers, Litton, Okura, Toyota, Camel, Elvo, UTIT, Saurer, Truetzschler, Schlafhorst, and Hollinsworth. Several of these systems were procured using the Design Build method.

DESIGN BUILT CONCEPT

When you initially embark upon designing and implementing a large, complex material handling system you are confronted with several dilemmas. The following is a short list of the questions you will be asking yourself.



- How do I determine what is the best design and equipment ?
- How do I go about getting the detailed design?
- How and to what detail do I write specifications?
- From whom do I solicit bids?
- How do I compare bids? (apples and oranges)
- Is a simulation required? To what detail? And by whom?
- Who will manage the project?

The answers to these questions depend upon the procurement and implementation method you choose.

DESIGN AND PROCUREMENT OPTIONS

There are several ways to go about designing, implementing, and procuring a material handling system. I will briefly discuss four of the most common methods. There are also combinations of the methods.

1. 100% Self Performing

If you have a large, diverse, dedicated staff, you can develop your own concepts, do detailed design, write specifications, obtain bids, and manage the integration and installation. The following are some common problems with this approach.

- Having people skilled in the necessary disciplines is rare.
- Resource (people) leveling is a problem.
- Software specifications can be very difficult.

2. Contract with Consulting firm

You can contract with an Engineering Consulting firm to help in the design; writing of specifications, obtaining bids, and project management. The following is a list of concerns with this approach.

- Construction Engineering firm or material handling firm?
- How do you evaluate their qualification and capabilities?
- How do you choose the right firm?
- System suppliers do a lot of the design.
- Responsibility lies with the suppliers.
- They won't be with you on Saturday night at 11:00.
- Most not that qualified on highly complex systems and just bring a lot of boiler plate.
- Ideally suited for certain jobs.

3. Cost Plus

The "Cost Plus" approach can be used in several ways. You can use various portions of the two previous methods and enter into a "Cost Plus" arrangement for the remaining portions. You can also pick a preferred supplier and enter into a "Cost Plus" contract for the entire project. The following is partial list of concerns with this method.

- You don't know what the final cost will be.
- Most companies don't like "Cost Plus" arrangements.
- No real incentive to control cost and is efficient.



4. Design Build Partnership

Another approach is the “Design Build” method. Under this arrangement you choose a “Design Build Partner”. The two of you together design the system, write the specifications, choose bidders, manage and install the system.

You choose a “Partner” based on the system to be implemented. For instance, if the system is going to have a lot of computer control and software, you should choose a “Partner” who is highly skilled in this area. Software and controls are the most important items in an Integrated Material Handling System. Your “partner” should have the following typical qualifications.

- Be self-performing in a major portion of the system.
- Have skilled and talented people in all areas of Material Handling.
- Have any specific skills that may be required in your project.
- Have simulation capabilities if required.
- Be very proficient in PLC’s and machine control.
- Have system in place for specifying and bidding equipment that they do not make. (“buy outs”)

CASE HISTORY

SLKP was building a new state of the art textile facility. We had developed our own concepts and basic designs. We then looked for a “Partner” who had the best hardware we were looking for, mainly AS/RS and AEM’s, and who was second to none in software and controls. We knocked on a few doors and kicked a few tires and decided upon our “Design Build Partner”.

At that point we entered into a small contract for the detailed design, hardware and software specifications, and bidding of “buy out”, components. The “buy out” components included conveyors, racks, general construction, computers, electrical and mechanical installation. The AS/RS’s, AEM’s, software, project management, simulation, etc., were negotiated with the “Partner”. We were involved in every step of this process. We then negotiated a fixed sum price to implement the system.

The following is a partial list of the advantages and disadvantages of the “Design Build Partnership” approach.

Advantages

- You can use a consultant for system conceptualization.
- Initial money is spent toward project implementation.
- You have more control of all aspects of the project.
- Partnership and teamwork from Day 1.
- People developing the concepts, designing, and writing specifications are the same people that will have to make it work.
- You can choose all of the best equipment for you system.
- Minimal finger pointing.
- Shortest time from concept to commissioning.
- On subsequent projects you both know what each other’s strengths and weaknesses are.

Disadvantages

- Perceived loss of leverage.
- Lack of competitive bidding process on all aspects.
- Change orders are not totally eliminated.
- Takes a lot of involvement.



CONCLUSION

The "Design Build" approach is not the method to be used on all projects, but it is definitely a viable option on large integrated systems. We have used this method on several projects and will continue to use it when appropriate. There are a lot of "white elephant" material handling systems in the world and most were procured under the competitive bid process. We feel that the "Design Build Partnership" gives us the greatest chance of having a successful system.

Finally, you have to understand and be comfortable with the "Design Build Partnership" approach to enter into the agreement.

COLLABORATIVE PARTNERSHIPS AS A BUSINESS PROCESS

Chuck Gates, Caterpillar

Caterpillar launched a major modernization effort in the mid 1980's called the "Plant With a Future Program," or PWAF. PWAF encompasses the entire spectrum of modernization including machines, equipment, systems, processes, people and logistics.

Prior to PWAF, Caterpillar utilized a traditional approach to procurement. First, our staff prepared a comprehensive Bid Specification Package that was sent to potential suppliers with an invitation to submit a quote on the work specified. Those quotes then had to be reviewed in detail by our staff and a series of meetings commenced which eventually reduced the number of potential suppliers.

With PWAF, Caterpillar decided to approach the project differently. We decided to leverage the experience we had gained working with small groups of vendors on a major installation and start up in our Product Assembly Operation. We expected that continuing that multi-supplier relationship would result in cost advantages since software could be transported and the learning curve of creating a cohesive work team would be minimized. This expectation was realized well beyond our initial projections.

We entered into a partnership in spirit with the same vendors. They, in turn, committed to each other and to the next project. We actually consummated the agreement with a handshake, rather than the project contract negotiations associated with traditional procurement.

At **Caterpillar's Aurora, Illinois** facility, the Design/Build process has been ongoing since 1986 and has resulted in multiple successful systems. **First Operations** is a project completed in 1993 that automated Cat's plate handling and burning process. Plate is received manually and positioned at one of several input stands where the system takes over. The plate is stored in a buffer plate farm until needed. This plate farm is served by one of several automated overhead magnet cranes used in the system. When a part is ordered by Cat's pull system of production, the proper sized plate is retrieved and run through a descaling machine. The plate is then routed to a transfer car to one of 18 burning tables at the three submerged arc burners. Burned parts and the plate skeleton are removed by another automated overhead magnet crane and taken to the straightening operation. Here the plate skeletons are removed from the system. Small parts are routed to buffer storage in a User Point Manager. Larger parts are straightened prior to induction into buffer storage. The buffer storage interfaces directly with operators in the machining areas and with automated monorail system that delivers to the other downstream operator.

At Cat's **Building B in Aurora**, axle assembly is aided by this combination storage Facility/User Point Manager. The entire system was devised and implemented utilizing the Design/Build approach. Entry into the system is made by pallet and tote sized loads delivered to the induction points by fork truck operators. The interface to the automated machining facility is accomplished by direct hands-off from the User Point Manager to either set up operators or directly to automated self guided vehicles that deliver directly to the machining centers.



Completed materials are re-entered to the buffer storage system for access by assemblers on the other side. This system has improved inventory accuracy and greatly reduced work in process inventories while shortening production lead times.

Caterpillar established a series of critical success factors, which are evaluated against traditional project experiences to evaluate the effectiveness of teaming. Overall team effectiveness is a key component of this evaluation. We viewed teamwork as absolutely essential since the multiple team providers must continually work closely with each other to make the interdependencies and equipment connectivity successful. This is a point I cannot stress enough.

These vendor partners must also commit in spirit and in practice to concerted mutual effort to achieve the project goals. Caterpillar also made this commitment, as any company must be prepared to do if teaming is to be successful. The mutual, concerted efforts include extended, off site sessions where the progress of the planning and design activities were reviewed in detail. These exchanges of information worked to gel our team into a more cooperative, well functioning group.

There were many daily, weekly and monthly team meetings with the partners to review progress, develop corrective action plans and to celebrate accomplishments. Celebrating accomplishments is a key component that facilitates the bonding of the individual into a cohesive team. Throughout the project we encouraged frequent interactions and socializing. We actively resisted the opportunities to revert to the traditional cultures of blaming each other for the many problems that arise. We found that the more the team members appreciated each other, the less critical they were. A healthy culture of professionalism and friendship prevailed, based on the common commitment to a set of success driven principles.

Those principles included the shared belief that its everybody's job and that anybody on the team could be trusted to accomplish tasks. Individual commitments to success were never in doubt.

We believe that we were successful because we worked with a team that was indeed best in class. Each member of the team, both individually and corporately, brought significant depth of technical experience and expertise to the team. Its important that team members be qualified for the duties assigned. This includes both from vendor partners and user partners.

At Caterpillar, there were at least four different point of views that were observed during the project process. These views all pretty much shared the same general categories for success: namely technical, cultural and financial characteristics. They differed only in the amount of emphasis placed on each of the elements of success. Engineers tended to focus on the technical success achieved. Financial experts looked to the ROI analysis. While many managers viewed the success as predominately one of human dimensions.

What eventually developed was a balance of all three-success factors. The lesson here is that implementation of the technology was not the major source of success. People made the difference. Human capital was the vital link to financial success.

Caterpillar has utilized the partnership approach we're referring to today as Design/Build in a number of its PWF projects. Regardless of which one I refer to the results are similar. I'd like to highlight just a few.

First, and probably most important from a practical point of view, the projects were operational when promised. This on time performance is critical to the process being successful. Those on the teams knew that system performance is the key to overall reasons for the accomplishments we've enjoyed.

Those accomplishments include projects where we were able to reduce Work-In-Process inventories and assembly time significantly while increasing product quality.

Significant additional long term benefits were achieved in terms of leverage internal human resources whose exposure to and work alongside the vendor team members made them more valuable to Caterpillar in both their current and subsequent assignments. The team approach also resulted in long-term process excellence and the best available material handling system technology being incorporated into our PWF systems.



Benefits of the Collaborative Design Build Approach

Design/Build partnerships can achieve optimal system design through partnerships that transcend the traditional procurement process and enter into an interactive design process that is based on mutual trust, complete openness and integrity. It seeks objective solutions to the problems at hand and then implements those solutions up to 50% faster than systems procured in the traditional method.

Other major benefits of the Productive Partnership method are: workable systems, manageable systems, most up to date at start up, assured ownership, intimate knowledge of the system for successful operation, and continuous improvement if possible.

Collaborative solutions produce overall lower system costs. Often these reductions are achieved through faster start ups that provide beneficial use sooner than traditional procurement. Often, however, additional value is obtained through precise specifications that are more accurate since there is no holding back of information.

Competitive component bidding continues to be utilized to assure the most favorable purchase terms. Optimal project schedules are more likely to be achieved through the open communications that develop with this approach. Increased use of standard software results in proved, tested packages being incorporated into the system. All of these facets result in faster ROI than traditional procurement processes that involve mailing bid packages to a series of bidders, and waiting for responses that must be evaluated.

Finally, the Design/Build process lowers system risk through the combination of clear problem definition, the application of proven designs to address the problems identified and use of fully tested software that is selected and implemented by one continuous team from start to finish.

The flexibility that is central to the process allows for optimal contracting either to the partner or directly to third parties for schedule optimization. Considerations of objectivity, creativity and competitive pricing are all favorable. The professionals involved in the collaboration are the keys to handling these are in the User's best interest.

The examples of successful Collaborative Partnership at Apple Computer, Caterpillar, Nike Europe and Sara Lee Knit Products are representative of the companies who are leading the way for others to follow. We encourage you to review their stories and pursue further contact.

